

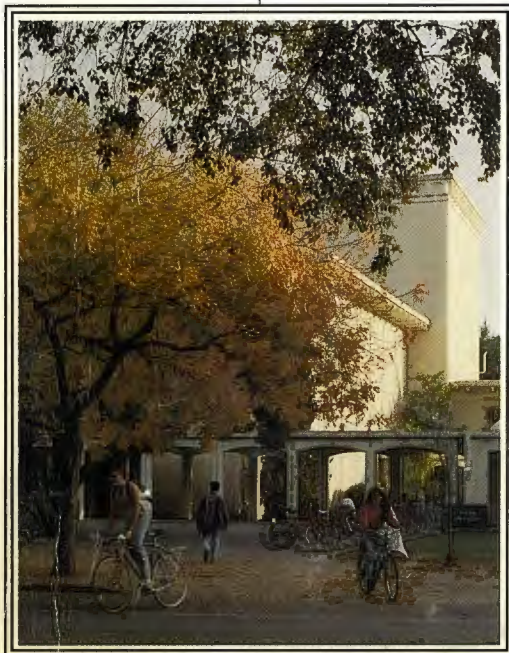
NUTRITION

ADVISING

UC DAVIS

1994-95 General Catalog

*Letters
&
Science*

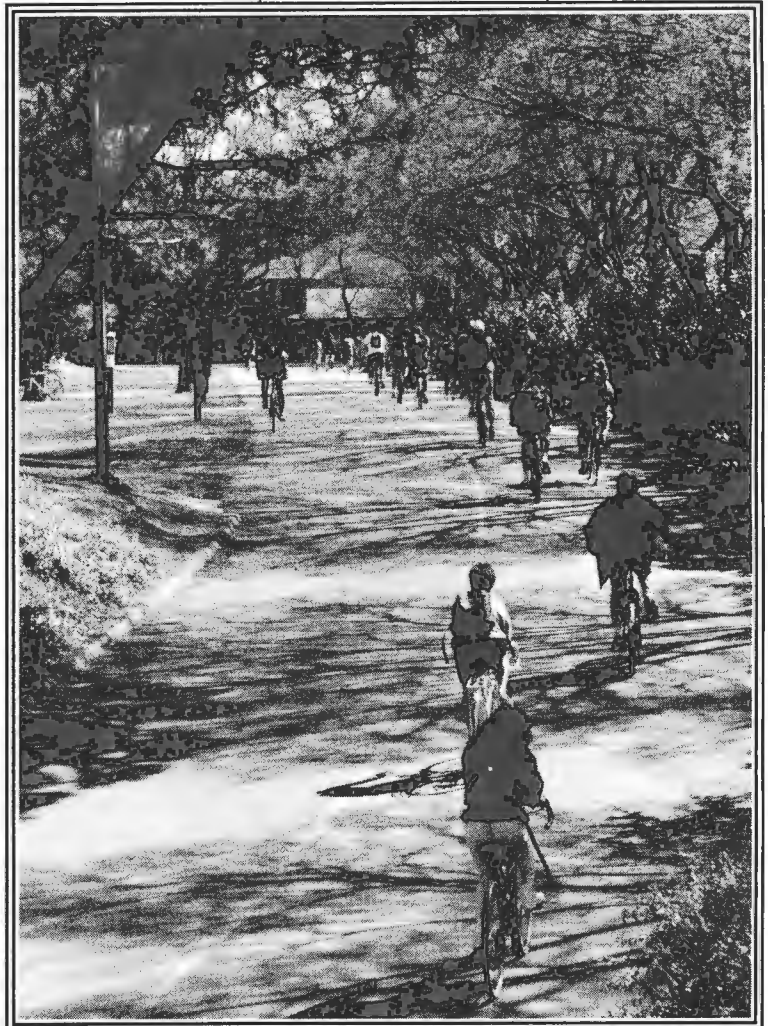


**AGRICULTURAL &
ENVIRONMENTAL
SCIENCES**

ENGINEERING

UC DAVIS

1994-95 General Catalog



UC DAVIS

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IT IS THE RESPONSIBILITY OF THE INDIVIDUAL STUDENT TO BECOME FAMILIAR WITH THE ANNOUNCEMENTS AND REGULATIONS OF THE UNIVERSITY PRINTED IN THIS CATALOG AND THE CLASS SCHEDULE AND ROOM DIRECTORY.

The University of California, Davis will provide assistance to the visually impaired regarding the information contained in this catalog. Questions should be directed to the office or department concerned.

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Davis Campus Map/inside back cover

ADDRESS DIRECTORY

University of California
Davis, California 95616
(916) 752-1011 (main campus number)

Office of the Chancellor

Mrak Hall
916-752-2065

College of Agricultural and Environmental Sciences

228 Mrak Hall
916-752-0107

College of Engineering

2132 Bainer Hall
916-752-0553

College of Letters and Science

Social Sciences and Humanities Building
916-752-0392

Division of Biological Sciences

66 Briggs Hall
916-752-0410

Graduate Studies

252 Mrak Hall
916-752-0650

School of Law

1011 King Hall
916-752-0243

Graduate School of Management

106 AOB 4
916-752-7362

School of Medicine

Medical Sciences 1C
916-752-0331

School of Veterinary Medicine

1018 Haring Hall
916-752-1360

Office of Summer Sessions

44 Mrak Hall
916-752-1647

University Extension

1333 Research Park Drive
916-757-8777

Admissions

Undergraduate:	Office of Admissions 175 Mrak Hall 916-752-2971 EOP Office of Admissions 175 Mrak Hall 916-752-2993
Graduate:	Graduate Studies Admissions 252 Mrak Hall 916-752-0655
Law:	School of Law Admissions 115 King Hall 916-752-6477
Management:	Graduate School of Management 106 AOB 4 916-752-7399
Medicine:	School of Medicine Admissions Medical Sciences 1C 916-752-2717
Veterinary Medicine:	School of Veterinary Medicine Admissions 1044 Haring Hall 916-752-1383

Office of the Registrar

124 Mrak Hall
916-752-2973
(for registration information, transcripts, the *General Catalog*)

Financial Aid Office

North Hall
916-752-2390
(undergraduate and graduate loans, grants, employment information)

Scholarship Office

207 North Hall
916-752-2397
(undergraduate scholarships)

Fellowships and Graduate Scholarships

Graduate Studies
252 Mrak Hall
916-752-7481

Teaching and Research Assistantships

Write to department or group concerned.

Housing

Community:	Student Housing Office 916-752-2483
Residence Halls:	Student Housing Office 916-752-2033
Student Family Housing:	Orchard Park 916-752-4000

ASUCD (Associated Students UCD)

3rd floor, Memorial Union
916-752-1990

Disability Resource Center

160 South Silo
916-752-3184 (voice), 916-752-6833 (telephone device for the speech and hearing impaired)

Memorial Union Information Desk

916-752-2222

News Service

334 Mrak Hall
916-752-1930

Relations with Schools/EOP Outreach Services

2828 Chiles Road
916-757-3108

Residency Matters, Legal Analyst

300 Lakeside Dr, 7th Floor
Oakland, CA 94612-3565

Student Health Service

54A Cowell Student Health Center
916-752-2300 (voice, and telephone device for the speech and hearing impaired)

Information Services Office

Buehler Alumni and Visitors Center
916-752-8111
(campus tours, maps, and information)

ACADEMIC CALENDAR*

	FALL 1994	WINTER 1995	SPRING 1995	FALL 1995 (tentative)
Deadline for filing Independent Study Program project proposal form	April 14, Thurs.	Oct. 12, Wed. (1994)	Jan. 19, Thurs.	April 14, Fri.
<i>Class Schedule and Room Directory</i> available	May 1994	Oct. 31, 1994	February 6	May 22
Students pick up <i>RSVP**</i> registration forms	May 23–27	Oct 31–Nov. 1	February 6–7	May 22–23
Faculty advisers available	May 26–27	November 3–4	February 9–10	May 25–26
<i>RSVP</i> Pass 1 (assigned appointments)	May 31–Sept. 4	November 7–18	February 13–26	May 30–Sept 3
<i>RSVP</i> Pass 2 (assigned appointments)	September 6–21	Nov. 28–Dec. 9	March 5–17	September 5–20
Final day to pay fees and register for classes without incurring a \$50 late fee	September 9	December 9	March 10	September 8
Quarter begins	Sept. 26, Mon.	Jan. 3, Tues.	March 30, Thurs.	Sept. 25, Mon.
Final day to petition for reclassification to resident status	September 9	December 9	March 10	September 8
Instruction begins	Sept. 29, Thurs.	Jan. 5, Thurs.	April 3, Mon.	Sept. 28, Thurs.
Final day <ul style="list-style-type: none"> of late fee payment to drop courses via <i>RSVP**</i> to change from part-time to full-time status or from full-time to part-time status to file petitions for PELP—current quarter 	Oct. 12, Wed.	Jan. 19, Thurs.	April 14, Fri.	Oct. 11, Wed.
Final day <ul style="list-style-type: none"> to add courses via <i>RSVP**</i> 	Oct. 19, Wed.	Jan. 26, Thurs.	April 21, Fri.	Oct. 18, Wed.
Final day <ul style="list-style-type: none"> to opt to take courses on a P/NP basis to file to take courses on a S/U basis 	Nov 2, Wed.	Feb. 8, Wed.	May 5, Fri.	Nov. 1, Wed.
Monday classes meet		Mar. 16, Thurs.		
Instruction ends	Dec. 9, Fri.	Mar. 16, Thurs.	June 9, Fri.	Dec. 8, Fri.
Final examinations	Dec. 12–17	Mar. 18–24	June 10–16	Dec. 11–16
Quarter ends	Dec. 17, Sat.	Mar. 24, Fri.	June 16, Fri.	Dec. 16, Sat.
Commencement			Mid-June	
Academic and Administrative Holidays	Nov. 24–25 Dec. 23, 26 Dec. 30, Jan. 2	Jan. 16 Feb. 20 Mar. 27	May 29	Nov. 23–24 Dec. 25–26 Dec. 29, Jan 1
Filing for Graduation				
Filing period for those who expect to complete work for a bachelor's degree to file for candidacy with the Office of the Registrar †	June 1–Sept. 16	Nov. 9–Dec. 22, 1994	Feb. 7–Mar. 24	June 1–Sept. 22
Filing for Minor Program				
Deadline for students who plan to complete a minor program to file with the Dean's Office ‡ Agricultural and Environmental Sciences College of Letters and Science	Oct. 12 Dec. 9	Jan. 19 March 16	April 14 June 9	Oct. 11 Dec. 8
Admission/Readmission Deadlines				
Deadline for undergraduates to file admission applications for 1994-95	Nov. 30, 1993	July 31, 1994	Oct. 31, 1994	Nov. 30, 1994
Deadline for filing applications with the Registrar for readmission to undergraduate status	Aug. 29, 1994	Nov. 8, 1994	Feb. 2, 1995	July 31, 1995
Financial Aid Deadlines				
Filing period for grants, loans, work-study, and California Student Aid awards for 1995-96		Jan. 1–Mar. 2		

Summer Sessions I and II, 1995

June 19–July 28, 1995, and July 31–Sept. 8, 1995

* Dates are subject to change and should be checked with appropriate *Class Schedule and Room Directory*.

***RSVP* (Register Students Via Phone) is the UC Davis telephone registration system. Adds or Drops after the *R.S.V.P.* deadlines require permission of the dean and a \$3.00 fee.

† For students graduating September 1995, the filing period is May 24–July 5.

‡ For students graduating September 1995, the deadline to file a minor program with Dean's Office is July 7.

DEGREES OFFERED BY UC DAVIS

Undergraduate majors and professional studies are administered by the colleges and schools listed. All graduate programs are administered by Graduate Studies.

Major or Discipline	Degree*	Administering School or College
Administration	M.B.A.	Graduate School of Management
Aeronautical Science and Engineering	B.S.	College of Engineering
African American and African Studies (Afro-American Studies)	A.B.	College of Letters & Science
Agricultural and Environmental Chemistry	M.S., Ph.D.	
Agricultural and Managerial Economics	B.S.	College of Agricultural & Environmental Sciences
Agricultural Economics	M.S., Ph.D.	
Agricultural Education	credential	College of Agricultural & Environmental Sciences
Agricultural Systems and Environment	B.S.	College of Agricultural & Environmental Sciences
Agronomy	M.S.	
American Studies	A.B.	College of Letters & Science
Animal Behavior	Ph.D.	
Animal Science	B.S., M.A.M., M.S.	College of Agricultural & Environmental Sciences
Animal Science and Management	B.S.	College of Agricultural & Environmental Sciences
Anthropology	A.B. or B.S., M.A., Ph.D.	College of Letters & Science
Applied Behavioral Sciences	B.S.	College of Agricultural & Environmental Sciences
Applied Mathematics	M.S., Ph.D.	
Applied Physics	B.S.	College of Letters & Science
Art	M.F.A.	
Art History	A.B.	College of Letters & Science
Art Studio	A.B.	College of Letters & Science
Atmospheric Science	B.S., M.S., Ph.D.	College of Agricultural & Environmental Sciences
Avian Sciences	B.S., M.S.	College of Agricultural & Environmental Sciences
Biochemistry	B.S.	Colleges of Agricultural & Environmental Sciences or Letters & Science
Biochemistry and Molecular Biology	M.S., Ph.D.	
Biological Sciences	A.B. or B.S.	Colleges of Agricultural & Environmental Sciences or Letters & Science
Biological Systems Engineering	B.S.	College of Engineering
Biomedical Engineering	M.S., Ph.D.	
Biophysics	Ph.D.	
Cell and Developmental Biology	Ph.D.	
Chemical Engineering	B.S.	College of Engineering
Chemical/Biochemical Engineering	B.S.	College of Engineering
Chemical Engineering/Materials Science and Engineering	B.S.	College of Engineering
Chemistry	A.B. or B.S., M.S., Ph.D.	College of Letters & Science
Chicana/Chicano (Mexican-American) Studies	A.B.	College of Letters & Science
Child Development	M.S.	
Chinese	A.B.	College of Letters & Science
Civil Engineering	B.S.	College of Engineering
Civil Engineering/Materials Science and Engineering	B.S.	College of Engineering
Classical Civilization	A.B.	College of Letters & Science
Classics	M.A.	
Community Development	M.S.	
Community Nutrition	B.S.	College of Agricultural & Environmental Sciences
Comparative Literature	A.B., M.A., Ph.D.	College of Letters & Science
Comparative Pathology	M.S., Ph.D.	
Computer Engineering	B.S.	College of Engineering
Computer Science	B.S., M.S., Ph.D.	College of Letters & Science
Computer Science and Engineering	B.S.	College of Engineering
Design	B.S.	College of Agricultural & Environmental Sciences
Dietetics	B.S.	College of Agricultural & Environmental Sciences
Dramatic Art	A.B., M.A., M.F.A., Ph.D.	College of Letters & Science
East Asian Studies	A.B.	College of Letters & Science
Ecology	M.S., Ph.D.	
Economics	A.B., M.A., Ph.D.	College of Letters & Science
Education	M.A., M.Ed., Ph.D., Ed.D.†, credential	
Electrical Engineering	B.S.	College of Engineering
Electrical Engineering/Materials Science and Engineering	B.S.	College of Engineering
Endocrinology	M.S., Ph.D.	
Engineering	M.Engr., M.S., D.Engr., Ph.D.	
Engineering—Applied Science	M.S., Ph.D.	College of Engineering
English	A.B., M.A., Ph.D.	College of Letters & Science
Entomology	B.S., M.S., Ph.D.	College of Agricultural & Environmental Sciences
Environmental and Resource Sciences	B.S.	College of Agricultural & Environmental Sciences
Environmental Biology and Management	B.S.	College of Agricultural & Environmental Sciences
Environmental Policy, Analysis, and Planning	B.S.	College of Agricultural & Environmental Sciences
Environmental Toxicology	B.S.	College of Agricultural & Environmental Sciences
Epidemiology	M.S., Ph.D.	
Evolution and Ecology (Zoology)	A.B. or B.S.	Colleges of Agricultural & Environmental Sciences or Letters & Science
Exercise Science	M.S.	

Fermentation Science	B.S.	College of Agricultural & Environmental Sciences
Fiber and Polymer Science	B.S.	College of Agricultural & Environmental Sciences
Food Biochemistry	B.S.	College of Agricultural & Environmental Sciences
Food Engineering	B.S.	College of Engineering
Food Science	B.S., M.S., Ph.D.	College of Agricultural & Environmental Sciences
French	A.B., M.A., Ph.D.	College of Letters & Science
Genetics	B.S., M.S., Ph.D.	Colleges of Agricultural & Environmental Sciences or Letters & Science
Geography	A.B. or B.S., M.A., Ph.D.	College of Letters & Science
Geology	A.B. or B.S., M.S., Ph.D.	College of Letters & Science
German	A.B., M.A., Ph.D.	College of Letters & Science
Greek	A.B.	College of Letters & Science
History	A.B., M.A., M.A.T., Ph.D.	College of Letters & Science
History of Art	M.A.	
Horticulture	M.S.	
Human Development	B.S., Ph.D.	College of Agricultural & Environmental Sciences
Hydrologic Sciences	M.S., Ph.D.	
Immunology	M.S., Ph.D.	
Individual Major	A.B., B.S.	Colleges of Agricultural & Environmental Sciences or Letters & Science
International Agricultural Development	B.S., M.S.	College of Agricultural & Environmental Sciences
International Relations	A.B.	College of Letters & Science
Italian	A.B.	College of Letters & Science
Japanese	A.B.	College of Letters & Science
Landscape Architecture	B.S.	College of Agricultural & Environmental Sciences
Latin	A.B.	College of Letters & Science
Law	J.D.	School of Law
Linguistics	A.B., M.A.	College of Letters & Science
Materials Science and Engineering	B.S.	College of Engineering
Mathematics	A.B. or B.S., M.A., M.A.T., Ph.D.	College of Letters & Science
Mechanical Engineering	B.S.	College of Engineering
Mechanical Engineering/Materials Science and Engineering	B.S.	College of Engineering
Medicine	M.D.	School of Medicine
Medieval Studies	A.B.	College of Letters & Science
Microbiology	A.B. or B.S., M.S., Ph.D.	Colleges of Agricultural & Environmental Sciences or Letters & Science
Music	A.B., M.A., M.A.T., Ph.D.	College of Letters & Science
Native American Studies	A.B.	College of Letters and Science
Neuroscience	Ph.D.	
Nutrition	M.S., Ph.D.	
Nutrition Science	B.S.	College of Agricultural & Environmental Sciences
Pharmacology and Toxicology	M.S., Ph.D.	
Philosophy	A.B., M.A., Ph.D.	College of Letters & Science
Physical Education	A.B. or B.S., M.A.	College of Letters & Science
Physics	A.B. or B.S., M.S., Ph.D.	College of Letters & Science
Physiology	B.S., M.S., Ph.D.	Colleges of Agricultural & Environmental Sciences or Letters & Science
Plant Biology (Botany)	A.B. or B.S.	Colleges of Agricultural & Environmental Sciences or Letters & Science
Plant Biology	M.S., Ph.D.	
Plant Pathology	M.S., Ph.D.	
Plant Protection and Pest Management	M.S.	
Political Science	A.B., M.A., Ph.D.	College of Letters & Science
Political Science—Public Service	A.B.	College of Letters & Science
Population Biology	M.S., Ph.D.	
Preventive Veterinary Medicine	M.P.V.M.	School of Veterinary Medicine
Psychology	A.B. or B.S., Ph.D.	College of Letters & Science
Range and Wildlands Science	B.S.	College of Agricultural & Environmental Sciences
Religious Studies	A.B.	College of Letters & Science
Rhetoric and Communication	A.B., M.A.	College of Letters & Science
Russian	A.B., M.A.	College of Letters & Science
Sociology	A.B., M.A., Ph.D.	College of Letters & Science
Sociology—Organizational Studies	A.B.	College of Letters & Science
Soil Science	M.S., Ph.D.	
Soil and Water Science	B.S.	College of Agricultural & Environmental Sciences
Spanish	A.B., M.A., Ph.D.	College of Letters & Science
Statistics	A.B. or B.S., M.S., Ph.D.	College of Letters & Science
Textiles	M.S.	
Textiles and Clothing	B.S.	College of Agricultural & Environmental Sciences
Textile Arts and Costume Design	M.F.A.	
Vegetable Crops	M.S.	
Veterinary Medicine	D.V.M.	School of Veterinary Medicine
Wildlife and Fisheries Biology	B.S.	College of Agricultural & Environmental Sciences
Women's Studies	A.B.	College of Letters & Science

*A.B.—Bachelor of Arts, B.S.—Bachelor of Science, M.A.—Master of Arts, M.A.M.—Master of Agricultural Management, M.A.T.—Master of Arts in Teaching, M.B.A.—Master of Business Administration, M.Ed.—Master of Education, M.Eng.—Master of Engineering, M.F.A.—Master of Fine Arts, M.P.V.M.—Master of Preventive Veterinary Medicine, M.S.—Master of Science, D. Engr.—Doctor of Engineering, Ph.D.—Doctor of Philosophy, J.D.—Doctor of Law, M.D.—Doctor of Medicine, D.V.M.—Doctor of Veterinary Medicine.

†Joint program between UCD and CSU, Fresno.

MINOR PROGRAMS OFFERED BY UC DAVIS

Minor programs are offered by both the College of Agricultural and Environmental Sciences and the College of Letters and Science. The College of Engineering does not offer any minors.

Minor Program	Offering Department	Administering College
African American and African Studies (Afro-American Studies)		College of Letters & Science
Aging and Adult Development	Human Development	College of Agricultural & Environmental Sciences
Agricultural Computing and Information Systems	Agronomy	College of Agricultural & Environmental Sciences
Agricultural Entomology	Entomology	College of Agricultural & Environmental Sciences
American Studies		College of Letters & Science
Anthropology		College of Letters & Science
Apiculture	Entomology	College of Agricultural & Environmental Sciences
Applied Biological Systems and Technology		College of Agricultural & Environmental Sciences
Art History		College of Letters & Science
Art Studio		College of Letters & Science
Asian American Studies		College of Letters & Science
Biological Sciences		Colleges of Agricultural & Environmental Sciences or Letters & Science
Chicana/Chicano (Mexican-American) Studies		College of Letters & Science
Chinese		College of Letters & Science
Community Development	Applied Behavioral Sciences	College of Agricultural & Environmental Sciences
Community Nutrition	Nutrition	College of Agricultural & Environmental Sciences
Comparative Literature		College of Letters & Science
Computer Science		College of Letters & Science
Dramatic Art		College of Letters & Science
East Asian Studies		College of Letters & Science
Education		College of Letters & Science
Energy Policy	Environmental Studies	College of Agricultural & Environmental Sciences
English		College of Letters & Science
Entomology		College of Agricultural & Environmental Sciences
Environmental Horticulture		College of Agricultural & Environmental Sciences
Environmental Policy Analysis	Environmental Studies	College of Agricultural & Environmental Sciences
Environmental Geology	Geology	College of Letters & Science
Environmental Toxicology		College of Agricultural & Environmental Sciences
Fiber and Polymer Science	Textiles and Clothing	College of Agricultural & Environmental Sciences
Food Service Management	Nutrition	College of Agricultural & Environmental Sciences
French		College of Letters & Science
Geography		College of Letters & Science
Geology		College of Letters & Science
Geophysics	Geology	College of Letters & Science
German		College of Letters & Science
Greek	Classics	College of Letters & Science
History		College of Letters & Science
History and Philosophy of Science		College of Letters & Science
Human Development	Applied Behavioral Sciences	College of Agricultural & Environmental Sciences
Insect Ecology	Entomology	College of Agricultural & Environmental Sciences
International Agricultural Development	Applied Behavioral Sciences	College of Agricultural & Environmental Sciences
Italian		College of Letters & Science
Japanese	Chinese and Japanese	College of Letters & Science
Latin	Classics	College of Letters & Science
Linguistics		College of Letters & Science
Mathematics		College of Letters & Science
Medical-Veterinary Entomology	Entomology	College of Agricultural & Environmental Sciences
Medieval Studies		College of Letters & Science
Music		College of Letters & Science
Native American Studies		College of Letters and Science
Nature and Culture		College of Letters and Science
Nematology		College of Agricultural & Environmental Sciences
Nutrition and Food	Nutrition	College of Agricultural & Environmental Sciences
Nutrition Science	Nutrition	College of Agricultural & Environmental Sciences
Philosophy		College of Letters & Science
Physical Education		College of Letters & Science
Physics		College of Letters & Science
Plant Biology (Botany)		Colleges of Agricultural & Environmental Sciences or Letters & Science
Political Science		College of Letters & Science
Psychology		College of Letters & Science
Recreation	Environmental Studies	College of Agricultural & Environmental Sciences
Religious Studies		College of Letters & Science
Rhetoric and Communication		College of Letters & Science
Russian		College of Letters & Science
Sociology		College of Letters & Science
Spanish		College of Letters & Science
Statistics		College of Letters & Science
Textiles and Clothing	Textiles and Clothing	College of Agricultural & Environmental Sciences
War-Peace Studies	International Relations	College of Letters & Science
Women's Studies		College of Letters & Science

INTRODUCTION



UC DAVIS

With 5,200 acres, UC Davis ranks first in physical size of the nine campuses of the University of California. It's also one of the nation's top 20 universities in research funding and has 24 undergraduate programs rated among the country's top 10, including the No. 1 botany department. What does this mean to you as a student? It means that the University's reputation for excellence has attracted a distinguished faculty of scholars and scientists in all fields of scholarship. Creative teaching and academic innovation are encouraged by several programs, including the \$25,000 Prize for Teaching and Scholarly Achievement, believed to be the largest award of its kind in the country.

The teaching faculty of 1,700 is also supported by campus resources such as the Teaching Resources Center, which helps professors and teaching assistants sharpen their teaching skills, and the Learning Skills Center, which assists faculty in preparing classroom materials. Constructive criticism is provided by the *Student Viewpoint*, an evaluation of classes and instructors compiled each year from course questionnaires completed by students. Additional academic resources include laboratories; natural reserves; institutes; and centers for research, teaching, or service to students, faculty, or the community.

The Davis campus has undergraduate colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science. Undergraduate enrollment is close to 17,500 students. Graduate Studies administers graduate study and research at all schools and colleges. Professional studies are carried on at the schools of Law, Management, Medicine, and Veterinary Medicine. Nearly 5,400 students are engaged in graduate or professional study.

A Small-Town Setting

Davis is surrounded by open space—including some of the most valuable agricultural land in the state. Outdoor sports enthusiasts will find many beautiful recreational areas within a 70-mile drive from campus: Folsom Lake, Clear Lake, Lake Berryessa, the Napa and Sonoma valleys, and the historic Mother Lode country. The Sierra Nevada mountains, Lake Tahoe ski resorts, and coastal areas of Mendocino and Monterey are about 150 miles from Davis.

If you prefer city life, Sacramento, the state capital, is only 15 miles to the east, and San Francisco is just 72 miles to the southwest. Both cities offer the symphony, the ballet, sporting events, theater, shopping, and other entertainment.

For long distance travel, Davis has a Greyhound bus terminal and an Amtrak station. If you travel by plane, the Sacramento Metropolitan Airport is an easy 20-minute drive from downtown Davis. Within Davis, bicycles are a favorite mode of transportation. The terrain is flat and 50 miles of bike paths crisscross the city. With more bicycles per person than any other city in the nation, Davis has earned the title "City of Bicycles."

Winters in Davis are generally mild. It rarely snows, but you should get good use from your rainwear. Summers are sunny, hot, and dry. On some summer days, the thermometer can exceed 100 degrees, but overnight

temperatures generally drop back into the fifties. Spring and fall weather is among the most pleasant in the state.

The City of Davis

Ecologically aware and socially innovative, Davis has a small-town friendliness and spirit of volunteerism that distinguishes it from cities of similar size. Residents are active in local, national, and international political causes, in the arts, and in community organizations ranging from Little League to the Rotary Club.

Students comprise nearly half of the city's population of 50,000, making Davis one of the state's few remaining "college towns." You'll find an abundance of bookshops, coffee houses, and restaurants catering to students in the bustling downtown area adjacent to campus.

Though closely linked to the University, the city maintains a strong identity of its own. The Davis Art Center, Comic Opera Company, Musical Theatre Company, and several local galleries provide creative outlets for people in the community and supplement the cultural events presented by the University.

The city has long recognized the importance of open space in maintaining its small-town atmosphere and has created 20 city parks offering a variety of attractions: tennis courts, playgrounds, swimming pools, playing fields, and even a skateboard facility.

Campus Life

Like the city of Davis, the campus has a relaxed, country atmosphere, with plenty of open space, trees, and lawns. Even as the student population grows, the campus manages to maintain its informal, friendly ambience.

Underlying the casual style of Davis students, however, is a fundamental seriousness and a dedication to academic excellence. Davis students do study hard. After your studying is done, however, you can relax at a movie, public lecture, dance recital, or concert. For the energetic, intercollegiate sports, club sports, and one of the largest intramural programs in the country offer athletics for fun or competition.

Davis welcomes the exchange of opinions and ideas and is committed to advancing the diversity of its students, faculty, staff, and administrators. UC Davis's commitment to a learning environment characterized by mutual respect and understanding is reflected in the "Principles of Community" (see the opposite page).

The University Farm

Davis was founded in 1905 as the "University Farm" where students from the first UC campus in Berkeley learned the latest in agricultural methods and technology. This beginning gained Davis students their nickname, "Cal Aggies." As the state's population grew, so did demand for higher education, and in 1922, in conjunction with the UC Berkeley College of Agriculture, the degree of Bachelor of Science in Agriculture was awarded to students completing the Davis program. A few years later, the Davis campus had its own College of Agriculture.

In 1948 California's only School of Veterinary Medicine was established at Davis. The College of Letters and Sci-

PRINCIPLES OF COMMUNITY

The University of California, Davis, is first and foremost an institution of learning and teaching, committed to serving the needs of society. Our campus community reflects and is a part of a society comprising all races, creeds, and social circumstances. The successful conduct of the University's affairs requires that every member of the University community acknowledge and practice the following basic principles:

We affirm the dignity inherent in all of us, and we strive to maintain a climate of justice marked by respect for each other. We acknowledge that our society carries within it historical and deep-rooted misunderstandings and biases, and therefore we will endeavor to foster mutual understanding among the many parts of our whole.

We affirm the right of freedom of expression within our community and also affirm our commitment to the highest standards of civility and decency towards all. We recognize the right of every individual to think and speak as dictated by personal belief, to express any idea, and to disagree with or counter another's point of view, limited only by University regulations governing time, place, and manner. We promote open expression of our individuality and our diversity within the bounds of courtesy, sensitivity, and respect.

We confront and reject all manifestations of discrimination, including those based on race, ethnicity, gender, age, disability, sexual orientation, religious or political beliefs, status within or outside the University, or any of the other differences among people which have been excuses for misunderstanding, dissension, or hatred. We recognize and cherish the richness contributed to our lives by our diversity. We take pride in our various achievements, and we celebrate our differences.

We recognize that each of us has an obligation to the community of which we have chosen to be a part. We will strive to build a true community of spirit and purpose based on mutual respect and caring.

*The "Principles of Community" were prepared and adopted after extensive discussion within the campus community about the need for a statement which reflects UC Davis' commitment to a learning environment characterized by diversity, understanding, and the acceptance of all people. This statement of common principles was published on April 20, 1990, carrying the endorsement of Chancellor Theodore L. Hullar and the leadership of the Davis Division of the Academic Senate, the Academic Staff Organization, the UCD Staff Assembly, the UCDCM Staff Assembly, the Associated Students of UC Davis (ASUCD), and the Graduate Student Association.

ence was founded in 1951, bringing degree programs in the humanities to add to the campus's strong scientific foundation. By 1959, Davis had expanded enough to be declared a general campus of the University by the Regents, and the campus continued to grow. The College of Engineering came into being in 1962. The School of Law held its first classes in the fall of 1966, and the School of Medicine admitted its first students in the fall of 1968. Davis's newest addition, the Graduate School of Management, opened its doors in 1981.

From its beginning as a 778-acre teaching farm, UC Davis has grown and diversified, establishing an international reputation for teaching and research.

THE UNIVERSITY OF CALIFORNIA

The University of California began in 1868, when Governor Henry H. Haight signed the Organic Act, thus providing for California's first "complete University." Classes began the following year at the College of California in Oakland. The first buildings on the Berkeley campus were completed in 1873, and the University moved into its new home. The following June, the University of California conferred bachelor's degrees on 12 graduates.

Today the University is one of the largest and most renowned centers of higher education in the world. Its nine campuses span the state, from Davis in the north to San Diego in the south. In between are the Berkeley, San Francisco, Santa Cruz, Santa Barbara, Riverside, Irvine, and Los Angeles campuses.

All the campuses adhere to the same admission guidelines and high academic standards, yet each has its own distinct character, atmosphere, and academic individuality. Together, the nine campuses have an enrollment of more than 163,000 students, 90 percent of them California residents.

Some 150 laboratories, extension centers, and research and field stations strengthen teaching and research while providing public service to California and the nation. The collections of the more than 100 UC campus libraries are surpassed in size in the United States only by the Library of Congress collection.

The faculty of the University of California is internationally known for its distinguished academic achievements. On its nine campuses, the University has 18 Nobel laureates, and membership in the National Academy of Sciences is the largest of any university in the country. In 1993-94, 32 faculty from within the University were named American Fulbright Scholars.

VISITING THE CAMPUS

You may wish to arrange a visit to UC Davis sometime before you apply. If you have specific questions about application procedures or entrance requirements, it is a good idea to write or visit the Undergraduate Admissions Office. For individual or group weekday tours of the campus, contact the Information Services Office at least four or five days in advance. Weekend tours depart from the Buehler Alumni and Visitors Center at 11:30 a.m. and 1:30 p.m. No appointment is necessary.

Information: Information Services Office, Buehler Alumni and Visitors Center, 916-752-8111

UNDERGRADUATE ACADEMIC PROGRAMS

The College of Agricultural and Environmental Sciences

The College of Agricultural and Environmental Sciences offers a unique combination of diverse programs that have grown from a shared commitment to improve the quality of life in all of its facets. The College is committed to creative education that emphasizes a spirit of discovery based on the premise that tomorrow's citizens will need to anticipate, understand, and solve emerging societal problems and contribute to the discovery and application of new knowledge. Hence, education in the College aims to foster:

- critical thinking and an appreciation for diversity in thought and in approaches to problem solving
- an ethos of lifelong learning—of teaching oneself and others while confronting challenges and solving problems
- an ability to move beyond either/or thinking and to pursue innovative and integrative understandings of the biological, social and physical sciences
- intellectual skills that will prepare individuals to secure a healthful physical and cultural environment based on a sound, respectful management of all resources
- a commitment to serving the public with an informed and open-minded dedication to understanding, critiquing and addressing complex societal needs and interests

The College is proud of its rich agricultural history and is world-renowned today for its accomplishments. Yet its sense of shared commitment has led it to expand the scope of its educational offerings to encompass a wider range of programs that highlight interconnections among the environment, plant and animal biology, and human health and well-being. Through a vast array of major programs, the College prepares high potential students for advanced studies in diverse disciplines and leadership in such arenas as public policy; research and development; managerial and natural resource economics; agricultural systems; environmental protection, safety and design; human nutrition, health and development; and the food, fiber, textile and apparel industries.





Students are brought into early contact with faculty advisers, graduate students and post-graduate researchers. A symbiotic relationship is developed in which undergraduate students bring new perspectives and join in the excitement of discovery. This enriches and broadens the educational experience of all.

Available to students are several levels of academic advising designed to enhance the student's undergraduate experience. Advisers assist students in course planning, meeting degree requirements and in taking maximum advantage of the resources available at the University. Students are encouraged to meet regularly with their assigned faculty adviser and with the Advising Associates and peer advisers housed in departmental offices. Through a shared commitment to education for service to society, College faculty, staff and students work together to improve the relationship between humanity and the natural world.

Information: College Office, 228 Mrak Hall, 916-752-0108

The College of Engineering

The College of Engineering has a tradition of excellence in instruction, in research, and in public service. To its undergraduate enrollment of approximately 2,300 and graduate enrollment of 700, the College offers both a friendly atmosphere and the varied academic programs in basic sciences and engineering that have made UCD engineering graduates highly valued in private practice and research.

The College has seven departments; each has outstanding programs of instruction. The Department of Biological and Agricultural Engineering combines study in engineering with instruction in the biological processes used to solve challenging environmental and technical problems. The Department of Applied Science instructs engineering graduate students in broad areas of scientific technology. The Department of Chemical Engineering and Materials Science offers curricula integrating an effective knowledge of chemistry, biological sciences or materials science engineering to enable students to solve problems in both current and future manufacturing technologies or to analyze the structure, properties, and behaviors of

materials. The Department of Civil and Environmental Engineering educates students to plan and design systems that have a direct impact on health and human productivity and the quality of human life. The Department of Computer Science offers programs of study that educate students in all aspects of design and use of computer hardware and software systems. The department also plays a significant service role for programs throughout the campus. The Department of Electrical and Computer Engineering offers programs in research and education crucial for the continued success of high technology industries in California and the nation, preparing students to design, analyze, and use electronic and computer systems effectively. The Department of Mechanical and Aeronautical Engineering educates students to design and manufacture complex engineering systems for transport, industry, or energy and to design, manufacture, and operate aircraft and aeronautical structures.

Every effort has been made to provide students in engineering with the maximum flexibility consistent with rigorous professional education standards. The key to flexibility is academic advising. Incoming students are assigned to a faculty adviser during their first term on campus and usually retain the same adviser throughout their college careers. Faculty advising is supplemented by a well-developed peer advising system and by staff advising in the Dean's Office and in many departments.

Undergraduate education in engineering at Davis is intended to serve as a sound basis for beginning professional practice in engineering design and development, as a preparation for careers in corporate or governmental operations, or as a foundation for graduate study. To these ends, the College emphasizes fundamental sciences to give the student the maximum postgraduate flexibility. Technological developments in recent years have made it clear that engineering education must be based on fundamentals or rapidly become obsolete.

Engineers will continue to face new challenges as society continues its demand for improvements in the quality of life, and as our state and nation demand greater

participation by engineers in efforts toward competitiveness in a global market. As a unit in a land-grant institution, the UCD College of Engineering must help maintain the technological leadership long enjoyed by the United States, while advancing technology for the benefit of all.

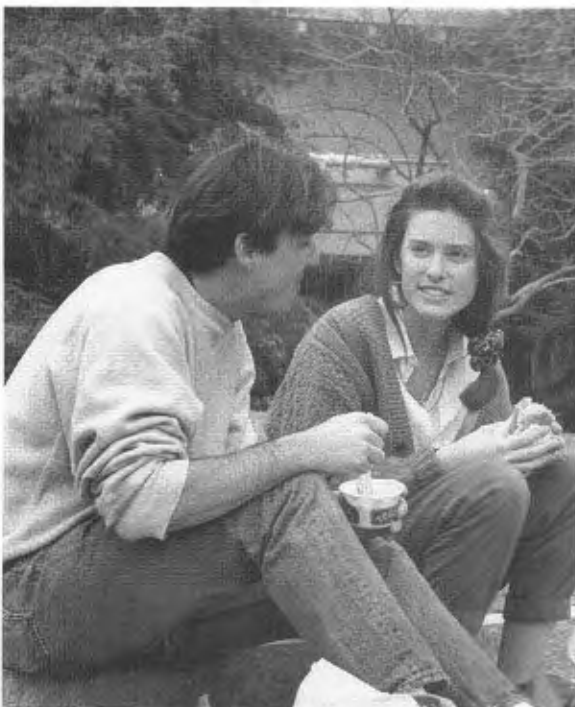
Information: Dean's Office, 1050 Engineering II, 916-752-0553

The College of Letters and Science

The College of Letters and Science is the largest of the three undergraduate colleges at UC Davis. Through its more than 500 faculty members, the College offers over fifty major programs of study and thousands of courses per year in the fine arts, humanities, life sciences, physical sciences, social sciences, and mathematical sciences. The College confers Bachelor of Arts (A.B.), Bachelor of Science (B.S.), and Bachelor of Arts and Science (B.A.S.) degrees.

The College of Letters and Science is a community of scholars and students sharing a commitment to liberal education rather than to specialized, vocationally oriented training. The College seeks to expose students to the worlds of human experience, of ideas, of artistic accomplishments, and of matter and things. Although separate and distinct to the casual observer, these realms are interconnected and may be studied in a coherent curriculum. It is within this curriculum that students are able to explore a variety of academic fields, engage in the pursuit of fundamental knowledge, and gain the capacity for independent study and thought. By learning to think carefully and critically, students will be able to continue the on-going process of education that begins in the classroom but continues over a lifetime. They will have learned how to learn—the ultimate objective of a liberal arts education.

The educational goals of the College are reflected in the three primary groups of requirements established by the faculty: the English Composition Requirement, the Foreign Language and Area Requirements, and the Major Requirements.



The **English Composition Requirement** is designed to ensure that students are well versed in the skills of written communication.

The **Foreign Language and Area Requirements** provide students with a broad background of knowledge, guide them in an exploration of the interdependencies of knowledge, and acquaint them with other cultures.

The **Major Requirements** are designed to provide students intellectual depth and competence in a selected area of study.

The College of Letters and Science recognizes and affirms the importance of perceptive and knowledgeable academic advising. The College has a well-developed system of faculty advisers, student peer advisers and professional staff advisers who are available for individual consultations with undergraduates in a variety of settings ranging from the Dean's Office to departmental offices to campus residence halls.

Woven throughout the tapestry of diversity that is the College of Letters and Science is a fundamental and unswerving commitment to excellence. The faculty of the College are dedicated to advancing the frontiers of human knowledge through research, artistic expression and other creative endeavors, and to the effective communication and application of that knowledge through teaching and public service. Together, faculty and students in the College of Letters and Science pursue these goals and ideals with enthusiasm and excitement.

Information: Dean's Office, Social Sciences and Humanities Building, 916-752-0392

ACADEMIC RESOURCES

Central Support

The University Library

The General Library at the University of California, Davis, is composed of the Peter J. Shields Library, the Physical Sciences Library, the Loren D. Carlson Health Sciences Library, the Agricultural Economics Library, and the library at the UCD Medical Center in Sacramento. A number of specialized departmental libraries are located on the campus, and the Law Library is located at the King Hall Law School.

The libraries contain over 2.6 million volumes and receive about 50,000 periodical and journal titles annually. UCD collections are accessible via the MELVYL on-line catalog. Shields Library houses the collections in the humanities, arts, social sciences, biological sciences, agricultural sciences, and mathematics. The collections of the Physical Sciences Library support teaching and research in engineering, computer sciences, and physical sciences. The library maintains a collection of one million research reports of the U.S. Department of Energy, the National Aeronautics and Space Administration, the Nuclear Regulatory Commission, and other governmental agencies. The Carlson Health Sciences Library serves the Schools of Medicine and Veterinary Medicine with a collection of approximately 235,000 volumes. The Agricultural Economics Library holds more than 7,800 bound volumes and 250,000 unbound pamphlets in this field. The

library at the UCD Medical Center provides a clinical collection of 25,000 volumes.

Information: Library Administration Office, Shields Library, 916-752-2110

Information Technology

Information Technology (IT) provides a range of computing, communications, and media services in support of research and instruction. A central Campus Access Point (752-2548) offers information and consulting on all aspects of information technology use at UC Davis. IT also provides academic access to microcomputing, workstation computing, and supercomputing (at various sites nationally). Students have access to media production equipment and to taped lectures and slide/tape programs at media resource centers. Microcomputer labs, both PC and Macintosh, are available for student use, and Student Easy Access (EZ) accounts allow students to use network services including electronic mail and file transfer, and to do computing on the UNIX and VMS operating systems available for academic use. EZ accounts are pre-allocated to all registered students, and can be activated by request at the Campus Access Point.

Information: 1400 Surge II, 916-752-2548; e-mail: ithelp@ucdavis.edu

University Arboretum

The 150-acre University Arboretum, located along Putah Creek's historic north fork, maintains a large collection of dry-land trees and shrubs for use in teaching and research. Outstanding plant collections include the Shields Oak Grove, the Mary Watis Brown Garden of California native trees and shrubs, the Ruth Storer Garden of drought-tolerant flowering perennials, and the T. Elliot Weier Redwood Grove. The Arboretum program of seed exchange is international in reputation, serves to distribute California native plants throughout the world, and has provided the University with numerous exotic plant specimens. Internships are available in nursery management, landscape design and maintenance, environmental education, conservation biology, Integrated Pest Management (IPM) and Geographic Information Systems (GIS).

Information: Arboretum Headquarters, 916-752-2498

Agricultural and Environmental Sciences

Agricultural History Center

The center coordinates and administers several research and publication programs designed to further the study of agricultural history. Primary research activities include studies of comparative farm policy, land use, the history of farm land values, the causes and consequences of agricultural mechanization and other sources of productivity improvements in the nineteenth and twentieth centuries, and the impact of scientific research.

Information: 378 Voorhies Hall, 916-752-1827

California Agricultural Experiment Station

The California Agricultural Experiment Station has branches in Davis, Riverside, and Berkeley. The Davis branch includes 500 faculty in over 30 departments in the College of Agricultural and Environmental Sciences

and the School of Veterinary Medicine. In addition to lab facilities, it has approximately 3,000 acres devoted to agricultural research in the areas of experimental crops, orchards, and animal facilities. The Experiment Station facilitates research in agricultural production, food processing, nutrition, animal care and disease prevention, consumer sciences and community development, and environmental quality. Research emphasis is placed on resource conservation and management, water and soil pollution, and regional planning.

Information: College of Agricultural and Environmental Sciences, 916-752-1610

Institute of Ecology

The Institute of Ecology has a campuswide responsibility to foster ecological and environmental research, provide intellectual leadership in ecology, administer resources and facilities, provide information on extramural support of ecological research, and maintain liaisons with governmental and private organizations interested in funding ecological and environmental research, or requiring advice on these subjects. The Ecology Institute has a publication series and sponsors national and international activities, including organizing symposia and conferences.

Information: 3104B Wickson Hall, 916-752-3938

Institute of Toxicology and Environmental Health (ITEH)

ITEH coordinates interdisciplinary research on biomedical and toxicological problems related to exposure to chemical, physical, and biological agents or to ionizing radiation. Studies on radioactive, mutagenic, carcinogenic, and teratogenic compounds are carried out in special animal holding facilities. Central laboratories exist for analytical chemistry, radiochemistry, ionizing radiation detection and quantification, cell biology research, and inhalation toxicology. The institute houses a major Universitywide program in human epidemiology and occupational health.

Information: Institute of Toxicology and Environmental Health, 916-752-1340

J.M. Tucker Herbarium

The J. M. Tucker Herbarium is used for research in plant systematics and ecology, and for handling public service requests. The herbarium contains more than 115,000 vascular plant specimens. It also houses 30,000 specimens of the Beecher Crampton Herbarium Collection of grasses and other range plants. Smaller teaching herbaria are located in various plant science departments on campus.

Information: Section of Plant Biology, 916-752-1091/0617

Mann Laboratory

Plant scientists in the Mann Laboratory study the physiology, biochemistry and molecular biology of harvested horticultural crops. They train students and disseminate information about postharvest biology and technology to growers, shippers, marketers, and consumers. The facility is part of the Department of Vegetable Crops, houses six faculty, and is equipped with 16 controlled-temperature rooms, seven research laboratories, a teaching laboratory, and a conference room.

Information: 104 Mann Laboratory, 916-752-1410; FAX: 916-752-4554

Natural Reserve System

The Davis campus administers seven natural reserves located within the state that are available for teaching and research.

- Bodega Marine Reserve, located at Bodega Bay, 100 miles west of campus, consists of coastal dune vegetation and bay and coastal tidal areas with facilities for overnight and longer stays (See Bodega Marine Laboratory below).
- Eagle Lake Field Station on the shore of Eagle Lake in northeastern California has boats, a small laboratory, and facilities for overnight and longer stays.
- Jepson Prairie Reserve, located in Solano County fifteen miles south of the campus, consists of native California bunchgrass grasslands and vernal pools.
- Donald and Sylvia McLaughlin Reserve, located near Clear Lake about 70 miles northwest of campus, consists of intercoastal range habitat and serpentine soil habitat.
- Putah Creek Campus Reserve is a 150-acre corridor along the north bank of Putah Creek with a remnant of the riparian (streamside) ecosystem.
- Quail Ridge Ecological Reserve consists of intercoastal range habitat located about 25 miles west of campus on a peninsula jutting into Lake Berryessa. The reserve has a small facility plus camping for overnight stays.
- Stebbins Cold Canyon Reserve, located about 24 miles west of campus, consists of several different plant communities found in California's inner and outer coast ranges.

The University maintains over 30 reserves throughout the state, many of which are available for teaching and research.

Information: Office of Research, 410 Mrak Hall, 916-752-6949/7073

Sustainable Agriculture Program: Student Experimental Farm

The Student Experimental Farm is an innovative teaching and research facility located on 25 acres of University land, and is the main focus of the Sustainable Agriculture Program. Since its inception, the Student Experimental Farm has provided students with unique opportunities to explore alternative agricultural technologies and philosophies through classes, special projects, internships, work study jobs, and original research. Because the farm includes several acres of land that have been managed organically for over a decade, it provides researchers with a facility for conducting field research into sustainable agriculture.

Information: Student Experimental Farm, 916-752-7645

UC Agricultural Issues Center

The UC Agricultural Issues Center, headquartered at Davis, is a Universitywide research and outreach unit that draws on expertise from many disciplines. The center is particularly interested in issues such as the impacts of demographic change on agriculture, natural resources, and rural life in California; the social, economic, and environmental effects of agricultural technologies; food consumption and international trade;

and local and national policies that affect Western agriculture or its workers.

Information: 110 University House, 916-752-2320

Water Resources Center

The center supports aquatic-related research in such areas as agricultural and biological sciences, economics, engineering, history, geography, law, meteorology, physical sciences, and political science. Research interests include drought responses, aquatic ecosystem structure and function, water resource systems engineering, economic evaluation of water development and conservation, political strategy in water resources development, environmental and energy relationships in water resources management, watershed hydrology, ground water use, soil and land use management in relation to water resources use, and maintenance and improvement of water quality.

Information: 1323 Academic Surge, 916-752-8070

Wildland Resources Center

The center coordinates activities among the University's research and extension programs and stimulates research into conservation, management, and utilization of wildland resources with a view toward the optimum present and future uses of wildlands. Projects focus on such topics as habitat conservation, assessment and management of timber resources and old-growth forests, and development of a system for evaluating California's environmental resources. The center's goal is to increase awareness of and advance the University's research and extension programs related to wildlands. The center serves as liaison between the University and state and federal agencies and other organizations concerned with wildland resources and problems.

Information: 1323 Academic Surge, 916-752-8070

Biological and Life Sciences

Adult Fitness Program

The Adult Fitness Program serves as an educational laboratory for undergraduate and graduate students engaged in advanced study of the role of exercise and nutrition in the management of optimal physiological function. Basic and clinical research studies are conducted in the areas of cardiovascular, respiratory, and metabolic functions. The program emphasizes risk reduction for cardiovascular disease and development of cardio-respiratory endurance. Studies stress fitness, relaxation, and weight reduction and control through appropriate diet and exercise programs which are individually prescribed after extensive medical and physiological testing.

Information: Department of Physical Education, 916-752-2540

Bodega Marine Laboratory and Reserve

The Bodega Marine Laboratory is an organized research unit dedicated to research and teaching in marine biology and related fields. Research areas include population biology/ecology, cell and developmental biology, and aquaculture and fisheries. Well-equipped facilities contain running seawater to two classrooms and most laboratories, a marine science



library, greenhouses, aviary, experimental freshwater system for anadromous fish studies, and a dive locker and air station. A number of undergraduate courses are taught during the academic year and summer session. The laboratory is located in Bodega Bay, Sonoma County, 100 miles west of Davis.

The Bodega Marine Reserve, part of the UC Natural Reserve System, is 362 acres of remarkably diverse habitats, including an excellent rocky intertidal zone, sand beaches, saltmarsh, lagoon tidal flats, freshwater marsh, coastal prairie, and dunes. Adjacent subtidal sand and rock habitats in a Marine Life Refuge are administered as part of the reserve. Current areas of research include population biology of shorebirds, marine invertebrates, fishes, and coastal plants; plant-insect interactions; subtidal biomechanics; and other topics.

Information: Bodega Marine Laboratory, P.O. Box 247, Bodega Bay, CA 94923, 707-875-2211; FAX: 707-875-2089; Internet: UCDBML@UCDAVIS.EDU

California Regional Primate Research Center (CRPRC)

The research staff of the California Regional Primate Research Center investigates selected human health problems for which the nonhuman primate is the animal model of choice. Research programs include behavioral and neurobiology, developmental and reproductive biology, respiratory diseases, virology and immunology, genetics, and a variety of biomedical collaborative research projects. A major theme of the CRPRC is the study of environmental influences on nonhuman primates and the identification of spontaneously occurring disorders.

Information: Primate Center, 916-752-0447

Food Intake Laboratory

The Food Intake Laboratory supports predoctoral and postdoctoral research in nutrition and behavior. Studies on the control of food intake and the nature of the factors that govern feeding choices are emphasized. The laboratory promotes collaborative research involving the roles of metabolic, psychological, neurochemi-

cal, hormonal, gender, genetic, and sensory inputs in the feeding behavior of experimental animals.

Information: TB 33, 916-752-7516

Health Sciences Research Labs

The Health Sciences Research Laboratories are composed of several high technology biological science facilities with research staff and assistance for faculty, staff, and students. These include:

- **Animal Surgery Laboratory**—provides facilities in compliance with NIH/AAALAC standards for researchers who perform both survival and non-survival experimental animal surgeries.

Information: Buildings H and J—ARS, 916-752-7756

- **Biochemistry and Special Instrumentation Laboratory**—a central facility providing investigators access to certain common but expensive laboratory equipment. Equipment includes ultracentrifuges and high speed centrifuges with rotors, scintillation and gamma counters, UV/VIS spectrophotometers, densitometers, Betaplate and Elisa readers.

Information: TB 161, 916-752-3166

- **Protein Structure Laboratory**—provides instrumentation for protein sequencing and for amino acid, protein and DNA synthesis. Also available are a microbore HPLC for high sensitivity peptide mapping and a preparative HPLC for large scale purification.

Information: 1145 Surge 1, 916-752-6228

Human Performance Laboratory

The Human Performance Laboratory houses equipment for the study of blood and muscle chemistry and enzymology, metabolism and energetics, muscle mechanics and electromyography, movement kinetics and kinematics, body composition and anthropometry, cardiorespiratory function during exercise in a controlled environment, control and acquisition of motor skills, and the psychosocial aspects of human performance. Apple Macintosh and IBM microcomputers are located within the laboratory and can be used for data

collection, reduction, graphing, and statistical analysis as well as for biomechanical, physiological systems, and human performance modeling.

Information: 164 Hickey Gym, 916-752-0965

Veterinary Genetics Laboratory

The laboratory is recognized for its pioneering research on animal blood groups and biochemical polymorphisms. Current research activities include gene mapping and discovery and screening of DNA markers and biochemical polymorphisms. Knowledge acquired will be applied to detecting parentage and solving questionable parentage cases arising from the breeding of horses, cattle, sheep, goats, llamas, alpacas, and dogs. Relationships between blood and DNA markers and livestock diseases are being investigated. We continue to explore red cell, serum and karyotyping for diagnosis of clinical diseases.

Information: Horse Bloodtyping Laboratory, Armstrong Tract, 916-752-2211; Cattle Bloodtyping Laboratory, Armstrong Tract, 916-752-7383

Veterinary Medicine Teaching and Research Center (VMTRC)

VMTRC is a clinical teaching and research center within the UCD School of Veterinary Medicine. The center offers a forum for teaching, research, and service programs for D.V.M. students, M.P.V.M. students, graduate students, food animal residents, university faculty and visiting researchers interested in food animal medicine. VMTRC programs emphasize herd health medicine, epidemiology and preventive medicine, production management, agricultural economics, food safety and animal welfare.

Information: UCD VMTRC, 18830 Road 112, Tulare, California 93274, 209-688-1731

Engineering and Physical Sciences

Center for Geotechnical Modeling

At the Center for Geotechnical Modeling, research in physical and numerical modeling is conducted by students from several departments and other universities. The center operates two centrifuges, including the 9-m

radius, 4,500-kg payload National Geotechnical Centrifuge. These centrifuges are used for research on geotechnical problems such as the effect of earthquakes on earth structures, toxic waste transport in groundwater, and deformations of foundations of bridges and large buildings.

Information: 119 Everson Hall, 916-752-6986

Crocker Nuclear Laboratory

This facility is an interdepartmental laboratory for the application of nuclear science to a variety of disciplines. The laboratory has research programs in nuclear physics and chemistry, air pollution analysis, activation analysis, biology, material damage studies, the effect of background radiation on computers, and historical studies. Isotopes produced by the variable-energy 76-inch cyclotron are used in clinical and research applications, including pioneering work in brain imaging.

Information: Crocker Nuclear Laboratory, 916-752-1460

Facility for Advanced Instrumentation

The Facility for Advanced Instrumentation is a training and research center where students, faculty, and staff have access to major scientific instruments. An electron microscope laboratory houses scanning and transmission electron microscopes adjacent to a specimen preparation laboratory. Morphometric analysis is supported by a computerized digitizing tablet and digitizing video image analysis computer. A mass spectrometer laboratory consists of a research-grade GC/MS, a high resolution instrument; and a newly acquired HPLC/MS equipped with electrospray ionization for analysis of proteins and peptides. The facility also coordinates access to additional instruments located in other departments around the campus.

Information: 9 Hutchison Hall, 916-752-0284

Institute of Theoretical Dynamics

The institute is an organized research unit promoting research and graduate education in the mathematical sciences. The institute provides a focus for extramural and intramural research pursuits; the two most impor-



tant research themes are dynamics and stochastic processes. Approximately 30 faculty from all of the colleges participate in the activities of the institute, which include conferences, workshops, seminars and summer schools. The institute provides networking of computer workstations, a gateway to supercomputers, research offices, and facilities for interaction with students, faculty, and visitors. Three core research areas are currently supported: mathematical biology, mathematical physics, and applied mathematical analysis, especially fluid dynamics. The institute houses the NSF Computer Graphics Facility for computational biology, which is open to faculty, graduate students and post-doctoral researchers for graphic visualization in biology.

Information: 2201 Academic Surge Building, 916-752-0938

Intercampus Institute for Research at Particle Accelerators

This institute conducts research that uses the unique facilities at national and international accelerator laboratories, particularly the Stanford Linear Accelerator Center, the Enrico Fermi National Accelerator Laboratory, the Japanese accelerator laboratory (KEK), and the German laboratory (DESY) in Hamburg. High-energy particle physics is the dominant area of research. The institute also promotes seminars and lectures by visiting researchers at individual campuses.

Information: Professor Richard L. Lander, Associate Director, 325 Physics/Geology Building, 916-752-1780

Nuclear Magnetic Resonance Facility

The Nuclear Magnetic Resonance Facility provides qualified researchers in the biological, medical and physical sciences access to state-of-the-art NMR instrumentation for spectroscopy and imaging. At present, the facility operates five spectrometers of varying purposes and capabilities. Two horizontal magnet bore spectrometers are used for *in vivo* spectroscopy and imaging of small animals and materials, and *in vitro* spectroscopy of perfused organs. Two vertical bore spectrometers are used primarily for solution studies of biomolecules, with an additional vertical bore instrument for *in vitro* studies. All of the spectrometers are multinuclear, and a large variety of high resolution, surface, and imaging coils are available for use. The facility also has SUN and Silicon Graphics workstations for off-line data processing and molecular modeling.

Information: Med Sci 1D, 916-752-7677

X-Ray Crystallographic Facility

The X-Ray Crystallographic Facility is located in the Department of Chemistry. There are three automated four-circle diffractometers. One of these has a Siemens area detector and is used with an 18 kW rotating anode X-ray source, making it suitable for biocrystallography. There are also traditional Weissenberg and precession cameras. All diffraction equipment is fitted with low-temperature (liq. N₂) attachments. In addition, the facility contains two VAX-station 3000 series computers, microcomputers, graphics terminals and multi-pen plotters. The laboratory is known for pioneering work in low-temperature crystallography, for the development of rapid structure determination methods, and techniques for handling reactive materials.

Information: Dr. Marilyn Olmstead, Department of Chemistry, 916-752-6668

Humanities and Social Sciences

Early Childhood Laboratory

The Early Childhood Laboratory is a teaching and research facility of the Division of Human Development and Family Studies. The laboratory provides a facility where students enrolled in human development courses develop observational techniques and participate with peers, children, parents, and professionals in a fully integrated early childhood program. Students study theories of development in a naturalistic setting. Students link theory to principles of interaction and develop a recognition and respect for individual differences. Selected undergraduate students participate in the research that is conducted at the laboratory by faculty and graduate students.

Information: West House of Early Childhood Laboratory, 916-752-2888

Humanities Institute

The Davis Humanities Institute organizes interdisciplinary research seminars open to graduates and faculty, and seeks to promote creative exchanges between the humanities, social sciences, and environmental sciences. Its fellowship program enables campus fellows, visiting fellows, and distinguished visitors to spend time in residence at the institute, and to participate in year-long or quarter-long seminars on designated themes. The seminar theme in 1994-95 will be Reading the Cultural Text. The institute also co-sponsors lectures with other departments; organizes a Friday noon series of talks and films entitled "Problems and Paradigms;" produces a calendar of events; and publishes a quarterly newsletter, *Humanities at Davis*.

Information: 707 Sproul Hall, 916-752-2295; FAX: 916-752-4263

Institute of Governmental Affairs

The Institute of Governmental Affairs (IGA) serves as a center for advanced social science research. IGA offers research opportunities for faculty, undergraduate, and graduate students, as well as for visiting scholars from throughout the United States and around the world. The institute houses the Center for State and Local Taxation. In addition, IGA sponsors five research programs: Program on Workable Energy Regulation; Pacific Rim Business and Development; Program on Leadership and Democracy; Program on Telecommunications Policy; and Program on Immigration, Population, and the Economy. The institute also supports a wide range of public affairs programs, seminars, and conferences designed to foster debate on political, economic, and social issues. IGA provides specialized library services and oversees the Social Science Data Service.

Information: Shields Library, 916-752-2042

Social Science Data Service

The Social Science Data Service provides assistance to students and faculty interested in quantitative research involving the use of the computer. The facility offers consultation on statistical packages, database management, survey and database development, and data archives.

Information: 161 AOB 4, 916-752-6063

UNDERGRADUATE ADMISSION



Information:
Undergraduate Admissions and Outreach Services
175 Mrak Hall
916-752-2971
916-752-4360 (TDD: telecommunication device for the speech and hearing impaired)

You can get the Application for Undergraduate Admission and Scholarship from the counseling office of any California high school or community college or from the admission office of any UC campus.

Application Filing Periods

Submit your application for admission during the filing period for the quarter in which you want to attend UC Davis.

Quarter of Attendance	Filing Period
Fall quarter 1994	November 1–30, 1993
Winter quarter 1995	July 1–31, 1994
Spring quarter 1995	October 1–31, 1994
Fall quarter 1995	November 1–30, 1994

Submit your completed application form to:

University of California
Undergraduate Application
Processing Service
P.O. Box 23460
Oakland, California 94623-0460

Winter and spring quarters may require that you submit the application directly to the Davis campus. Please call Undergraduate Admissions during the winter and spring filing periods to find out where to mail your application.

Application Fees

The basic application fee to apply to one campus of the University is \$40. For each additional campus you select, you must pay an extra \$40 fee. These fees are not refundable. Attach a check or money order made payable to the Regents of the University of California to the application form.

PREPARING FOR UNIVERSITY WORK

A carefully planned program of high school courses provides you with the best preparation for University work. As a prospective University student, you should give priority to completing the high school courses required for admission—the “A to F” subject requirements.

You should take college preparatory courses that will challenge you to work hard and will prepare you beyond minimum levels of competence in reading, writing, and mathematics. A student who is well prepared for University work will have taken four years of English in high school, four years of mathematics, two to three years of foreign language, two to three years of laboratory science, one year of history, and one or more years of art or humanities.

Reading: You should become proficient in reading and understanding technical materials and scholarly works. Learn to read analytically and critically, actively questioning yourself about the author’s intentions, viewpoint, arguments, and conclusions. Become familiar, and comfortable, with the conventions of standard written English, and with various writing strategies and techniques. Your reading experience should include original

works in their entirety, not just textbooks and anthologies, and should encompass a wide variety of forms and topics.

Writing: Effective critical thinking and proficiency with the written language are closely related, and both are skills that every University student must master. By University standards, a student who is proficient in English composition is able to: a) understand the assigned topic; b) select and develop a theme by analysis and argument; c) choose words which aptly and precisely convey the intended meaning; d) construct effective sentences, i.e., sentences that economically and successfully convey the writer’s ideas and display a variety of structures; and e) demonstrate an awareness of the conventions of standard written English.

If you plan to attend the University, you must take English courses in high school that require the development and practice of these skills. You must take at least four years of English composition and literature classes that stress expository writing.

Mathematics: Many undergraduate majors require preparation in mathematics beyond the three years required for admission to the University. All majors in the natural and life sciences, engineering, and mathematics require calculus. Many majors in the social sciences require statistics or calculus, or both. Calculus is also required for undergraduates preparing for careers in the environmental sciences, dentistry, medicine, optometry, pharmacy, and biostatistics. If you select a major that requires either calculus or statistics, you should expect to take that course during your first year at the University.

Prepare yourself for University courses in mathematics while you are still in high school. Good preparation includes a year of mathematics beyond second-year algebra (such as precalculus, mathematical analysis, analytic geometry) and, definitely, a course in mathematics during your senior year.

Algebra is necessary for success in University mathematics courses. Students who do not take a mathematics course during their last year in high school often find they need to take a preparatory course at the University in order to renew their algebra skills. The need to take such a course at the University could delay your undergraduate studies for which mathematics is a prerequisite.

Finally, take advantage of any guidance your high school offers in study skills and diagnostic tests designed to assist you in assessing your college preparation. Managing your time well and studying effectively are critical to excelling at the University. Together with solid academic preparation, these skills should enable you to realize your educational goals and, ultimately, fulfill your career aspirations.

ADMISSION AS A FRESHMAN

The University of California defines a *freshman applicant* as a student who has graduated from high school but has not enrolled since then in a regular session in any college-level institution. Summer session immediately following high school graduation is excluded in this determination.

Admission requirements vary for California residents and nonresidents. Nonresidents must meet higher scholarship requirements.

The following describes the minimum requirements to establish eligibility at the University of California. **At UC Davis, students generally must perform well above these minimums in order to gain admission.**

Requirements for California Residents

To be eligible for admission to the University of California as a freshman, you must meet the subject requirements, scholarship requirement, and examination requirements that are described on this and the following pages.

Subject Requirements: A to F

You must complete at least 15 high school units in the subject areas listed below. At least 7 of the required 15 units will have to be taken in the last two years of high school. The required course sequence is often referred to as the "A to F" pattern.

Courses taken in the ninth grade and completed with a grade of C or better can satisfy a subject requirement; however, the grades will not be used in computing your grade point average. If you receive a grade of D or lower in a ninth-grade course, you have not satisfactorily completed the subject requirement until you repeat the course (or, in some cases, complete a more advanced course) with a grade of C or better.

A. History/Social Science—2 years

One year of United States history, or one-half year of United States history and one-half year of civics or American government; and one year of world history, cultures, and geography.

B. English—4 years

Four years of English—composition and literature (classes should stress preparation for university study, including frequent and regular practice in writing expository prose compositions of some length). Not more than one year will be accepted from the ninth grade. (See English Proficiency below.)

C. Mathematics—3 years

Three years of mathematics—elementary algebra, geometry, and intermediate algebra. (Courses taken in grades seven and eight may partially satisfy the requirement if they are accepted by the high school as equivalent to its own courses.)

D. Laboratory Science—2 years

Two years of laboratory science providing fundamental knowledge in at least two of these three areas: biology, chemistry, and physics. Not more than one year of ninth grade laboratory science can be used to meet this requirement.

E. Language other than English—2 years

Two years of the same language other than English. Courses should emphasize speaking and understanding, and include instruction in grammar, vocabulary, reading, and composition. (Courses taken in grades seven and eight may satisfy this requirement if they are accepted by the high school as equivalent to its own courses.)

F. College Preparatory Electives—2 years

Two years in addition to those required in "A" through "E" above.

- **History and English:** courses that fit the general description for elective courses above.
- **Advanced mathematics:** trigonometry, linear algebra, precalculus (mathematical analysis), calculus, statistics, computer science, and similar courses. (Courses containing significant amounts of material for arithmetic or from shop, consumer, or business mathematics are not acceptable.)
- **Laboratory science:** courses in the biological and physical sciences. A general science course taken in grade nine as preparation for a laboratory science may be used.
- **Language other than English:** courses may be in either the same language used to satisfy the "E" requirement or a second foreign language. If a second language is chosen, however, at least two years of work in that language must be completed.
- **Social science:** courses that fit the general description for elective courses above, and that serve as preparation for lower division work in social science at the University. (Courses of an applied, service, or vocational nature are not acceptable.)
- **Visual and performing arts:** courses should enable students to understand and appreciate artistic expression, and to talk and write with discrimination about artistic materials studied. Courses that develop creative artistic ability or artistic performance may be used. (Courses that are recreational or are offered under physical education are not acceptable.)

If you are a California high school graduate, the courses used to satisfy the **Subject Requirement** must appear on a list that your high school principal has certified meets the course descriptions above, and has placed on file with the University's Office of Student Academic Services. If you submit courses from an out-of-state school, the Undergraduate Admissions Office will determine if your courses fulfill the Subject Requirement.

English Proficiency

Instead of a fourth year of high school English, you may satisfy the **English Proficiency Requirement** by completing one of the following:

- SAT II Subject Test in Writing (a score of 600 or above); or
- Advanced Placement Examination in English Composition and Literature or English Language and Composition (a score of 5, 4, or 3).

The requirement may also be satisfied with a transferable college-level English course in literature, composition, or speech, worth 3-semester or 4-quarter units in which you earned a grade of C or higher.

Scholarship Requirement

An applicant must have earned a grade of C or better in all high school courses to satisfy the "A" through "E" requirements above. The grades earned in these courses that are taken in grades ten through twelve

will be used to evaluate the grade point average for minimum eligibility.

If you attain a grade point average of 3.30 [where the letter grade A=4, B=3, and C=2, and in University-approved honors or advanced placement courses taken during the tenth, eleventh and twelfth grades (limit of four year-long courses with not more than two coming from the tenth grade) where the letter grade A=5, B=4, and C=3] in the required "A to F" subjects taken after the ninth grade, you will meet the minimum requirements to be eligible to enter the University, regardless of your scores on standardized tests. If your grade point average falls between 3.29 and 2.82, you will meet the minimum requirements for the University if you achieve the specified scores on the standardized tests (see the Eligibility Index opposite).

In determining the required grade point average, the University will use a semester grade of A in one course to balance a semester grade of C in another. Grades you received in courses taken in the ninth grade or earlier are not used in determining your grade point average. (However, these courses may be used to satisfy subject requirements.) The grades that appear on your official high school transcript, including those earned in accelerated and advanced courses, are the grades the University will use in evaluating your record. Grades are counted on a semester basis unless your school gives only year grades.

To meet the **Subject and Scholarship Requirements** you may repeat courses in which you received a grade of D or lower. The grade achieved in the repeated course will be calculated into the grade point average. There is no limit to the number of repeated courses that may be used in the "A to F" pattern, but each course may be repeated only one time.

Examination Requirement

All freshman applicants must submit scores from the College Board or the American College Testing (ACT) Program. If you are applying for admission to the fall quarter, take the tests no later than December of your senior year (earlier testing is recommended). The following tests are required:

- Scholastic Assessment Test-I (SAT-I—College Board)—The verbal and mathematics tests scores you submit must be from the same sitting

or

- American College Test

AND

- Three Scholastic Assessment Tests-II (SAT-II—College Board), which must include (a) writing test, (b) mathematics (level I or II), and (c) one test from the social studies or science or foreign language, or the test in English literature.

If you are a California resident and your grade point average in the required high school subjects is 3.30 or higher, the tests are required but your scores will not be used to determine your minimum eligibility for admission. (Reminder: At UC Davis, students generally must perform well above the minimums in order to gain admission.)

If your grade point average in the "A to F" requirement is less than 3.30, refer to the table below to see the examination scores you must earn to be eligible for University admission.

Eligibility Index

Grade Point Averages A-F Requirement	SAT† Total Scores	ACT* Composite Scores
2.82	1590	36
2.83	1570	36
2.84	1540	35
2.85	1520	35
2.86	1500	35
2.87	1470	34
2.88	1450	34
2.89	1430	33
2.90	1400	33
2.91	1380	33
2.92	1360	32
2.93	1330	31
2.94	1310	31
2.95	1290	31
2.96	1260	30
2.97	1240	30
2.98	1220	29
2.99	1190	28
3.00	1170	28
3.01	1150	27
3.02	1120	27
3.03	1100	26
3.04	1080	26
3.05	1050	25
3.06	1030	25
3.07	1010	24
3.08	980	23
3.09	960	23
3.10	940	22
3.11	910	22
3.12	890	21
3.13	870	21
3.14	840	20
3.15	820	20
3.16	800	19
3.17	770	19
3.18	750	18
3.19	730	18
3.20	700	17
3.21	680	17
3.22	660	16
3.23	630	16
3.24	610	15
3.25	590	15
3.26	560	14
3.27	540	14
3.28	520	13
3.29	490	12

*The American College Test (ACT) is scored in intervals of 1 point from a minimum of 1 to a maximum of 36.

†The Scholastic Aptitude Test (SAT) is scored in intervals of 10 points from a minimum of 400 to a maximum of 1600.

Make arrangements to take the required SAT-I and SAT-II by writing to College Board SAT, Princeton, NJ 08541. For the American College Test (ACT) write to American College Testing Program, Registration Unit, P.O. Box 168, Iowa City, IA 52240. (Test fees should be paid to the Testing Service, not the University.) UC Davis's College Board code is 4834 and the ACT code is 0454.

Requirements for Residents of Other States

If you are a freshman applicant who does not claim California residency, you must meet the following requirements for admission to the University of California:

- Graduate from a regionally accredited or state-accredited high school
- Satisfactorily complete the subject requirements listed under Requirements for California Residents
- Earn a grade point average of at least 3.4 (B+) in the courses used to meet the subject requirements
- Complete the examination requirements listed for California residents

Minimum Eligibility by Examination Alone

If you do not meet the minimum scholarship and subject requirements for admission, you can meet minimum requirements for admission as a freshman by examination alone. (If you have completed transferable college courses, College Board tests cannot be taken in academic subjects covered in those courses.) You must take the same College Board tests discussed above and receive a total score of at least 1300 on the SAT-I, or a score of 31 on the American College Test. Your total score on the SAT-II must be 1650 or higher with no score less than 500 on an individual test. If you are a nonresident applicant, your score on the SAT-II must be 1730 or higher.

High School Proficiency Examination

The University of California will accept the Certificate of Proficiency or the General Education Development (GED) certificate awarded by the State Department of Education, in lieu of the regular high school diploma. However, you must also meet all other University entrance requirements (subject, scholarship, examination).

Transfer Credit

Transfer credit may be granted to a freshman applicant for an acceptable college course taken while still in high school if an official transcript is received from the college that conducted the course.

Transfer credit is also granted for each College Board Advanced Placement Examination completed with a score of 3, 4, or 5. International Baccalaureate Higher Level Examinations with scores of 5, 6, or 7 will receive transfer credit.

ADVANCED PLACEMENT EXAMINATIONS

If you take one or more of the College Board Advanced Placement (AP) Examinations and score 3, 4, or 5, you will be awarded college credit. The credit will become part of the minimum 180 quarter units you need in order to receive a bachelor's degree. The credit from the AP Examinations may also be used to satisfy specific degree requirements. Consult the chart on the facing

page to learn how many units you will receive for an AP Examination (see the column headed: Credit Toward Degree), and how those units will be applied toward specific degree requirements (see the column headed: Credit Allowed Toward Specific Degree Requirements). Please note that the courses for which AP credit has been granted may not be used as a substitute for courses required as part of the UCD General Education Requirement. Rather, AP credits are counted as transfer credits and may reduce the number of General Education (GE) courses you have to complete. (See the GE section in Bachelor's Degree Requirements chapter.)

In general you may not earn University credit for courses that duplicate credit already earned through AP. There are, however, a few exceptions to this general rule. Since it is often difficult to know exactly which UCD course you should take when you have earned AP credit, you should talk with an academic adviser in your department or dean's office before selecting and enrolling in classes.

ADMISSION AS A TRANSFER STUDENT

The University of California defines a *transfer applicant* as a student who has been a registered student in a college or university or in college-level extension classes since last attendance at high school. Summer session attended immediately following high school graduation is excluded in this determination. If you are a transfer applicant, you may not disregard your college record and apply for admission as a freshman.

California residents must meet the requirements that follow. If you are not a California resident, see Requirements for Residents of Other States below. **At UC Davis, students generally must perform well above the minimums in order to gain admission.**

Minimum Requirements for California Residents

Transfer applicants must meet one of the following conditions:

- If you were eligible for admission to the University when you graduated from high school—meaning you satisfied the subject, scholarship, and examination requirements—you are *minimally eligible* for admission if you have a C (2.0) average in your transferable college coursework.

If you have completed fewer than 12 quarter or semester units of transferable college credit since high school graduation, you must also satisfy the examination requirement for freshmen. All transfer students, regardless of the date of high school graduation, must meet the high school requirements stated earlier in this catalog, or establish eligibility as junior-level transfers.

- If you have graduated from high school and meet the needed scholarship and examination requirements but you have not completed one or more of the "A to F" subjects while in high school, you will be minimally eligible to be considered for admission after you have:

College Board Advanced Placement (AP) Examination Credit

EXAMINATION	UCD COURSE SCORE	EQUIVALENCIES	CONTINUING COURSE	CREDIT TOWARD DEGREE	CREDIT ALLOWED TOWARD SPECIFIC DEGREE REQUIREMENTS	
ENGLISH						
English	5, 4	English 1, 3		8 units	English/Humanities Credit Satisfies Subject A requirement. <i>College of Agricultural and Environmental Sciences:</i> 4 units Four units satisfies first part of English composition requirement. <i>College of Engineering:</i> 8 units Satisfies English 1, 4 units toward Humanities/Social Sciences electives. <i>College of Letters and Science:</i> Satisfies first course toward English Composition requirement.	
English	3			8 units	Satisfies Subject A requirement.	
FOREIGN LANGUAGES						
French	5	French 22	French 23, or consultation with adviser	8 units	Humanities Credit/Unrestricted Electives For each foreign language examination passed. In the <i>College of Agricultural and Environmental Sciences</i> , satisfies credit toward breadth/Unrestricted electives. In the <i>College of Letters and Science</i> , examinations (except for Latin) satisfy the Foreign Language requirement. In the <i>College of Engineering</i> , 4 units toward Humanities/Social Science electives.	
French	4	French 21	French 22	8 units		
French	3	French 3	French 21	8 units		
German	5, 4	German 4	German 101, upper division literature courses	8 units		
German	3	German 3	German 4	8 units		
Latin (Vergil)	5, 4, 3	Latin 2	Determined by consultation with Classics adviser	4 units		
Latin (Lyric)	5, 4, 3	Latin 2	Determined by consultation with Classics adviser	4 units		
Spanish	5, 4	Spanish 21 or 8	Spanish 22, 23 or 24, or more advanced course in consultation with adviser	8 units		
Spanish	3	Spanish 3	Spanish 21, or consultation with adviser	8 units		
HUMANITIES						
Art Studio	5	Art Studio 2, 5		8 units	Humanities Credit/Unrestricted Electives In the <i>College of Letters and Science</i> , partially satisfies Area (breadth) requirements for A.B. degree. In the <i>College of Letters and Science</i> , partially satisfies Area (breadth) requirements for A.B. degree. In the <i>College of Letters and Science</i> , partially satisfies Area (breadth) requirements for A.B. degree. Satisfies American History and Institutions requirement. History 17A and 17B may be taken for full credit. History 4A and 4B may be taken for full credit. In the <i>College of Letters and Science</i> , partially satisfies Area (breadth) requirements for A.B. degree.	
Art Studio	4	Art Studio 2		8 units		
Art Studio	3			8 units		
Art History	5	Art History 1A, 1B, 1C		8 units		
Art History	4, 3			8 units		
American History	5, 4, 3	History 17A, 17B		8 units		
European History	5, 4, 3	History 4B, 4C		8 units		
Music	5, 4, 3	Music 10		8 units		
NATURAL SCIENCES						
Biology	5, 4, 3	Biological Sciences 10		8 units		Natural Sciences Credit/Preparatory Courses for Science Majors Biological Sciences 1A is the first course taken by most students contemplating majors in the Life Sciences. Although Chemistry 2A may be taken for full credit, students are strongly encouraged to enroll in the 2HA, 2HB, 2HC sequence. Credit for Computer Science Engineering 30 may serve as prerequisite for Computer Science Engineering 40 with consent of instructor. In the <i>College of Engineering</i> , examination awards units towards the unrestricted electives requirement. Mathematics 16A or 21A may be taken for full credit. Credit for Mathematics 16A or 21A equivalents may serve as prerequisite for Mathematics 16B or 21B. Mathematics 16A, 16B, 21A, or 21B may be taken for full credit. Mathematics 16A, 16B, 21A, or 21B equivalents may serve as a prerequisite for Mathematics 16B, 16C, 21B, or 21C. Mathematics 16A or 21A may be taken for full credit. Credit for Mathematics 16A or 21A equivalents may serve as prerequisite for Mathematics 16B or 21B. No credit for laboratory parts of Physics 5 or 9. Course equivalents may be used as prerequisite for succeeding courses of same series with consent of instructor. In the <i>College of Engineering</i> , only a score of 5 on Physics (CI and CII) Examinations applies toward Physics requirement.
Chemistry	5	Chemistry 2A	Determined by consultation with adviser	8 units		
Chemistry	4, 3	Chemistry 10		8 units		
Computer Science AB	5, 4	Computer Science Engineering 30	Computer Science Engineering 40	4 units		
Computer Science AB	3			4 units		
Computer Science A	5, 4, 3		Computer Science Engineering 30	2 units		
Mathematics AB	5, 4	Mathematics 12, 16A, or 21A	Mathematics 16B or 21B	4 units		
Mathematics AB	3		Mathematics 16A or 21A	4 units		
Mathematics BC	5	Mathematics 12, 16A-16B, or 21A-21B	Mathematics 16C or 21C	8 units		
Mathematics BC	4, 3	Mathematics 12, 16A, or 21A	Mathematics 16B or 21B	8 units		
Physics B	5	Physics 1A, 1B, 5A, 5B, 5C, 10	Determined by consultation with adviser	8 units		
Physics B	4, 3	Physics 10		8 units		
Physics CI	5	Physics 1A, 5A, or 9A		4 units		
Physics CI	4	Physics 1A or 5A		4 units		
Physics CI	3			4 units		
Physics CII	5, 4	Physics 1B		4 units		
Physics CII	3			4 units		
SOCIAL SCIENCE						
American Government and Politics	5, 4, 3	Political Science 1		4 units	Social Science Credit/Unrestricted Electives Political Science 1 satisfies American History and Institutions requirement. In <i>College of Agricultural and Environmental Sciences</i> , satisfies credit toward breadth requirement or Unrestricted electives. In <i>College of Engineering</i> , awards credit toward Humanities-Social Sciences electives requirement.	
Comparative Government and Politics	5, 4, 3	Political Science 2		4 units		
Economics (Micro)	5, 4, 3	Economics 1A	Determined by consultation with Economics adviser.	4 units		
Economics (Macro)	5, 4, 3	Economics 1B	Determined by consultation with Economics adviser.	4 units		
Psychology	5	Psychology 1, or 15-16		4 units		
Psychology	4, 3			4 units		

1. established an overall grade point average of 2.00 or better in another college or university;
2. completed with a grade of C or better appropriate college courses in the high school subjects that you lack; and
3. completed 12 or more transferable quarter (or semester) units, or have met the freshman examination requirement.

• If you did not meet the needed scholarship requirement or did not meet the scholarship requirement *and* lack the required subjects, you will be minimally eligible to be considered for admission after you have:

1. completed 84 transferable quarter (56 semester) units of credit in college courses (Note: Although the minimum requirement is 84 quarter/56 semester units, to be competitive for admission to UC Davis, students should complete at least 90 quarter/60 semester transferable units); and

2. established an overall grade point average of 2.40 or better in another college or university; and

3. completed one of the following:

- a. appropriate college courses, with a grade of C or better, in high school subjects that you lacked—up to two units (one unit=one year-long course) of credit may be waived except in English and mathematics;

or

- b. a college course, or courses, in mathematics; one transferable course in English; and one transferable course in either U.S. history, a laboratory science, or a language other than English, all with grades of C or better. The mathematics component may be satisfied in one of the following ways: a) take courses in algebra, geometry, and advanced algebra; b) take a course that employs the topics of advanced algebra—for example, college algebra, pre-calculus, calculus, linear algebra; c) take a transferable statistics course that has advanced algebra as a prerequisite.

Minimum Requirements for Residents of Other States

If you meet the requirements for admission as a non-resident freshman, you must have a grade point average of 2.8 or better in college courses that are accepted for transfer credit by the University of California.

If you don't meet the minimum requirements for admission as a nonresident freshman, you must have completed at least 84 quarter units (56 semester units) of transferable work with a grade point average of 2.8 or better *and* have completed the subject requirements for California residents.

Transferring to the College of Engineering

If you are admitted with *fewer than 84 quarter units* of college work (56 semester units), you are classified in lower division standing, and must complete one of the four Lower Division Programs listed under Engineering in the Programs and Courses section of this catalog. You are advanced to upper division standing after completing 84 units.

When there are more applicants than space available in the College, priority is given to transfers from California community colleges who have completed the lower division program for engineering with a high grade point average. You must select a major before admission, and once admitted, you may be limited in your freedom to change majors within the College.

Unit Credit for Courses Taken Elsewhere

The University gives unit credit to transfer students for courses they have completed at other accredited colleges and universities. To be accepted for credit, your courses must be comparable to those offered at the University, as determined by the Undergraduate Admissions Office.

A total of 105 quarter units (70 semester units) toward a university degree may be earned at a community (two-year) college. Only subject credit will be granted for courses taken in excess of these amounts.

UC Intercampus Transfer

If you are an undergraduate student currently or previously registered at another campus of the University of California and have not since been registered in another institution, you may apply for transfer to the Davis campus. Filing dates and application fees are the same as those listed for new applicants.

ADMISSION AS AN INTERNATIONAL STUDENT

International students attend the University of California, Davis from many countries in the world. An international application may be obtained by writing the Undergraduate Admissions Office, University of California, Davis, California, 95616. It is very important that the application be filed during the appropriate filing period.

To be eligible for admission to the University, international students need to meet specific academic and financial qualifications. International students are responsible for providing the University with all secondary school and college transcripts. The Test of English as a Foreign Language (TOEFL) is a requirement of admission for applicants from abroad or for those with little schooling in the United States when English is not the applicant's native language. A minimum score of 500 is required.

The Scholastic Assessment Tests (SAT-I and SAT-II) are required for international freshman applicants who are graduates of U.S. high schools or American-type schools abroad. These tests are also required for applicants who come from countries that do not have national, external examinations at the end of secondary school. Because many preliminary admission decisions are made on the basis of test scores and marks, all international freshman applicants are strongly encouraged to take these tests and to have the official scores reported to UC Davis as early as possible.

For transfer students, coursework is considered transferable if the applicant completed the course at an institution that is recognized by the University of California and is comparable to coursework offered at the University of California.



Most international students are required to complete a "Certification of Finances" form that attests to the student's ability to pay for non-resident tuition and fees and living expenses.

All international students who have not satisfied the Subject A requirement through domestic coursework or testing, or whose native language is not English, must take the Examination in English for Non-Native Speakers upon entrance to UC Davis. Depending on the results of the exam, students may be required to enroll in appropriate classes until they have achieved the necessary language skills.

UC Davis welcomes competent, qualified applicants from around the world.

CAMPUS SELECTION CRITERIA

UC Davis makes every effort to provide a place for all California resident applicants who meet the minimum admission requirements and file an application during the appropriate priority filing period.

In recent years, the number of applicants for some majors has far exceeded the number of spaces available. When UC Davis cannot accept all eligible applicants, it uses standards that are more demanding than the minimum requirements to select students. These standards, which are called selection criteria, identify those students who have demonstrated the capacity for high academic achievement and who have a variety of other qualities that can contribute to the strength and diversity of the campus community.

The selection criteria described below will be used for applicants for the fall 1995 term. The criteria may differ for the winter and spring terms because enrollment targets and applicant qualifications change. Applicants for winter or spring should contact the Undergraduate Admissions Office for more information.

Selection Guidelines

Each campus, in consultation with the Office of the President, develops enrollment targets that specify the number of new freshman and advanced standing students expected to enroll. Campuses that receive more applications than the number required to meet their enrollment target admit students using the criteria described below.

Freshman Applicants

Academic Criteria (used to select 60% of admits): Davis selects freshman applicants who have made the greatest effort to fully prepare academically as measured by the following criteria:

1. Calculated GPA on all academic courses completed in the "A to F" subject areas, with additional points given for honors courses. Maximum value is 4.00.
2. College entrance test scores—SAT-I or ACT and SAT-II test scores.
3. The number and content of college preparatory courses taken in academic subjects beyond UC minimums.
4. The number of University-approved honors or advanced placement courses completed or in progress.

Supplemental Criteria (used to select 40% of admits): Applicants are evaluated using the selection criteria described above in conjunction with the following supplemental criteria:

1. Personal accomplishments, talents, experiences, or interests that will contribute to the educational environment of the campus.
2. Special circumstances which may have affected the applicant's life, including personal hardship, disabilities, economic disadvantage, and membership in groups historically underrepresented at the University.

Transfer Applicants

Academic Criteria: Top priority for admission consideration is given to UC-eligible California community college junior level transfer applicants. Other UC-eligible transfer applicants will be admitted if space is available.

When applications far exceed the number of spaces available—for majors such as engineering, biological sciences, computer science, environmental policy analysis and planning, international relations, and psychology, for example—the completion of specific lower division preparatory courses for the major is required. Contact Undergraduate Admissions for information on which majors are so impacted.

Supplemental Criteria: The same supplemental criteria described above for freshmen are used.

Notification and Acceptance of Admission

Upon completion of a review of your academic records, you will be notified of your admission status by letter.

The length of time before admission notification varies, depending upon the completeness of your application. For example, most applicants for fall quarter will be notified of their admission status between March 1 and mid-March for freshmen, and March 1 and May 1 for transfer applicants. When you receive your notification of admission you will also receive an important form called the "Statement of Intent to Register" (SIR). Complete the form and return it to the Admissions office, along with the required *nonrefundable* \$100 deposit, in order to complete the admissions process. This advance deposit is applied to your University Registration Fee as long as you register in the quarter to which you are admitted. Intercampus transfer, EOP, and readmission applicants are not required to submit the \$100 advance deposit; however, they will pay *full* registration fees at the time of registration.

The Statement of Intent to Register (SIR) should be returned by May 1 (as a freshman) or June 1 (as a transfer) to notify the campus that you wish to attend. Students admitted to winter or spring quarter *must* return the SIR by the date specified in the notification of admission. Students not selected for admission consideration at the UC campuses to which they have applied may have their application considered at another UC campus where space is still available.

READMISSION

If you are a former UCD undergraduate student planning to return to UC Davis, you must file an Application for Readmission and pay a nontransferable, nonrefund-

able fee of \$40. This application is available in the Office of the Registrar. (You are a former student if you have interrupted the completion of consecutive terms of enrollment on the Davis campus.) Official transcripts of all work you may have attempted in the interim must be submitted to the Office of the Registrar.

Undergraduate students applying for readmission must file their applications on or before the following deadlines:

Quarter	Deadline Date
Fall 1994	August 24, 1994
Winter 1995	November 8, 1994
Spring 1995	February 2, 1995
Fall 1995	July 31, 1995

SPECIAL PROGRAMS

Concurrent Enrollment

Concurrent courses are regular University courses open to the community on a space-available basis through UC Extension. This program allows an individual to pursue academic interests and to test academic abilities at the University.

For information, write the University Extension Office, Research Park, University of California, Davis, CA 95616, 916-757-8777.

Educational Opportunity Program/Student Affirmative Action (EOP/SAA)

The Educational Opportunity Program/Student Affirmative Action assists students from ethnic groups that are underrepresented in the UC eligibility pool (African American, American Indian, Chicano, and Latino). Also, the program assists students with a disability and students from economically and/or educationally disadvantaged backgrounds. EOP/SAA can help you with the admission application process and offers academic, social, and cultural support. (See also under the Academic Advising and Student Resources chapter.) An admissions application fee waiver and financial aid are available to those individuals with demonstrated financial need. You can contact the Undergraduate Admissions Office for information on obtaining the fee waiver.

An EOP/SAA applicant may be admitted in one of these two ways: (1) as a freshman or advanced standing student who has met the standard admission requirements, or (2) as an admitted-by-exception student because the applicant has not met the admission requirements but has demonstrated strong academic potential.

To apply for the program, each applicant must complete the regular UC admission application form and complete the appropriate places related to EOP. In addition, the applicant is advised to discuss the reasons for requesting EOP assistance in the required essay.

Limited Status

Students in limited status are those whose special attainments qualify them to take certain courses in the University toward a definite and limited objective. Fees and filing dates are the same as those for new applicants. To apply for limited status admission, you must either have a bachelor's degree but not be a candidate

for an advanced degree, or have completed a substantial amount of college work with a satisfactory grade point average. You must also submit transcripts from all schools attended. You will not be admitted to limited status for the purpose of raising a low scholarship average.

As a limited status student you will be expected to maintain a certain scholarship average during a predetermined time of enrollment.

Admission to the College of Agricultural and Environmental Sciences requires the approval of the Admissions Officer and the dean of the college.

Enrollment pressures have necessitated closing this category of admission for the College of Engineering and the College of Letters and Science.

Second Baccalaureate

If you have a bachelor's degree substantially equivalent to one that is granted by the University of California, you may be allowed to enroll as an undergraduate seeking a second bachelor's degree. Admission in this category will depend upon a superior academic record and clear evidence of a change in objective. A Duplicate Degree Fee of \$6,000 annually is assessed for students with a bachelor's or higher degree who attend the University of California to obtain instruction at the baccalaureate level. Students are exempt from paying the Duplicate Degree Fee if they are enrolled in joint degree and double major programs; are seeking post-baccalaureate degrees, including education credentials or certificates; are nonresident students paying nonresident tuition; or qualify for certain categories of low-income student status, as defined in state law.

Admission to the College of Agricultural and Environmental Sciences requires the approval of the Admissions Officer and the dean of the college.

*Enrollment pressures have necessitated closing this category of admission for the College of Letters and Science. The College of Engineering will accept applicants if their first degree is **not** in engineering **and** if they complete the lower division engineering program at a California community college.*

Special Status

The special status classification is for applicants 21 years of age or older who have not had the opportunity to complete a satisfactory high school program or who have not completed a substantial amount of college work, but by reason of special attainment or background may be prepared to undertake certain courses at UC Davis toward a definite and limited objective.

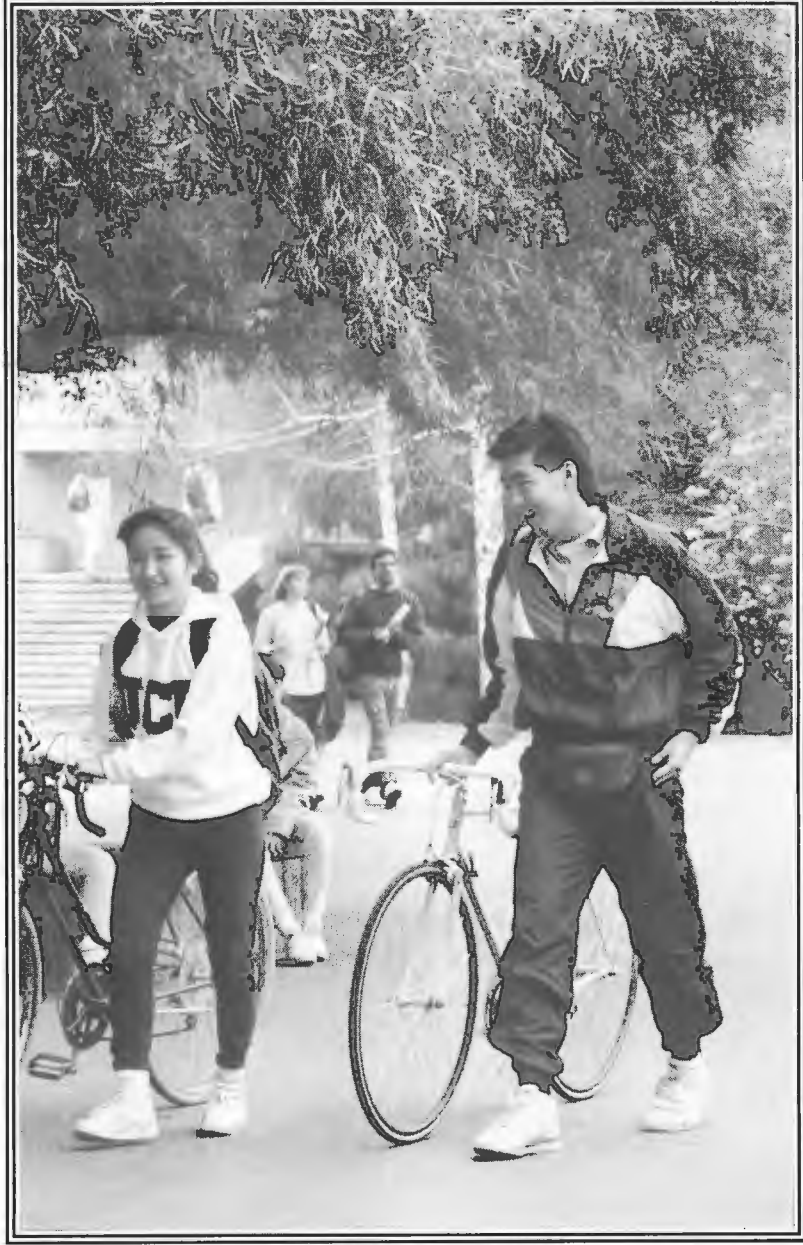
You will not be admitted to special status for the purpose of fulfilling requirements for admission as a regular student. Conditions for admission are determined by the Admissions Officer and are subject to approval by the dean of the college in which you plan to enroll. Admission is for a specified time only and a prescribed scholarship average must be maintained. Fees and filing dates are the same as those for new applicants.

Enrollment pressures have necessitated closing this category of admission for the College of Engineering and the College of Letters and Science.

ADMISSION CHECKLIST

- 1. Obtain the undergraduate admissions packet from your high school, a community college, or a campus of the University of California. If you are not a California resident, request an application from the Undergraduate Admissions Office, 175 Mrak Hall, University of California, Davis, CA 95616.
- 2. Complete the application including the essay and list the college and major you prefer. Attach a check or money order to cover the application fee with your application materials, and return them in the preaddressed envelope **during the priority filing period for the quarter in which you are interested.**
- 3. **Keep a copy of your application and essay.**
- 4. Retain for your records the notices received from both the Undergraduate Application Processing Service and the Undergraduate Admissions Offices which acknowledge receipt of your application.
- 5. If you are applying from high school, do not send a preliminary transcript unless requested to do so by Undergraduate Admissions. If you are applying as an advanced standing student, arrange to have all official transcripts sent. If test scores are required, please arrange to have these forwarded by the testing agency.
- 6. High school applicants to the fall quarter should take the SAT-I or ACT and SAT-II tests no later than December. We strongly encourage you to complete these tests by the November test date.
- 7. The Undergraduate Admissions Office may request additional information, such as transcripts, test scores, or confirmation of work in progress. Send this information right away so your application can be processed without delay. **Note: Your eligibility for admission cannot be evaluated until all your application materials are received, i.e., application form, filing fee, essay, official transcript (if required), work in progress, and test scores (if required).**
- 8. If you are admitted, keep your admission letter for your records.
- 9. Return your "Statement of Intent to Register" (SIR), "Statement of Legal Residence," and Student Address form along with the nonrefundable advance deposit of \$100 (if required) as soon as possible and no later than the date stated on the SIR so your registration materials can be ordered before you register.
- 10. After your SIR is received, you will be sent information from the Cowell Student Health Center. Return your completed Medical History and Immunization forms to the Cowell Student Health Center as soon as possible.

FEEES, EXPENSES AND FINANCIAL AID



FEES AND EXPENSES

Give careful consideration to the total financing of your University education. If you will need funds beyond those that you and your family can provide, you should apply for aid well in advance of enrollment. The deadlines for financial aid (grants, loans, work-study, and scholarships) are listed on the following pages.

These are the proposed fees for the 1994-95 academic year. Because they are subject to legislative and gubernatorial action, these fees may change without notice.

At the time of registration each quarter, every student must pay the following fees. (A Registration Fee Deferred Payment Plan, which allows students to pay their quarterly fees in three monthly installments, is available.)

Undergraduate Student Fees

University Registration Fee*	\$239.00
Memorial Union Fee	28.50
Associated Students Fee	23.50
Student Services Maintenance Fee	\$34.00
Educational Fee**	1121.00
Total for California residents	\$1,446.00
Tuition for nonresidents	2,566.00
Total for nonresidents	\$4,012.00
Optional Undergraduate Health Insurance Fee	(132.00)

Graduate Student Fees

University Registration Fee*	\$239.00
Memorial Union Fee	28.50
Graduate Student Association Fee	6.50
Health Insurance Fee	142.50
Educational Fee**	1121.00
Total for California residents	\$1,537.50
Tuition for nonresidents	2,566.00
Total for nonresidents	\$4,103.50

* University Registration Fee = \$237.00 in winter and spring quarters.

** Educational Fee = \$1120.00 in winter and spring quarters.

The Student Services Maintenance Fee is effective for a period of three years beginning fall quarter 1993. In May 1993, UC Davis undergraduates voted on and passed a referendum to establish the Student Services Maintenance Fee; the Fee was approved by the Regents. The Fee is assessed on undergraduates only, and helps fund selected student service programs.

The Undergraduate Health Insurance plan is a voluntary plan available to all undergraduates except for foreign undergraduate students, who must participate in the Graduate Student Health Insurance Plan and pay the Graduate Student Health Insurance Plan Fee. Graduate students must purchase the Graduate Student Health Insurance Plan unless they are able to prove comparable coverage under another insurance plan.

The Graduate Student Association Fee is optional for students in the Schools of Law, Medicine, and Veterinary Medicine. Law students are required to pay a Law Student Association Fee of \$8.00 per semester.

Parking Permit and Bicycle Licensing Fees

Students may be subject to the following fees for optional services (rates subject to change):

Parking (per year: \$60 to \$276 for cars, depending on the type of permit; \$108 for motorcycles; \$108 for night-time only permit, i.e., \$20 to \$74 per quarter)

Bicycles, fee for the California State License (initial license, \$6, and renewals, \$3). Required for all bicycles on campus.

For details concerning fees and deposits, consult the publication *1994-95 Student Fees and Deposits*, available from the Office of the Registrar. Current fees are also published in the *Class Schedule and Room Directory*.

Additional Fees for Professional Schools and Second Degrees

Effective fall 1994, students entering the Graduate School of Management, or Schools of Law, Medicine, or Veterinary Medicine will pay an additional **professional school fee**. Fees for the professional schools are listed in the relevant chapters in this catalog.

Students who have earned a baccalaureate or higher degree and who attend the University of California to obtain instruction at the baccalaureate level must pay a **Duplicate Degree Fee** of \$6,000 annually. Students are exempt from paying the Duplicate Degree Fee if they are enrolled in joint degree and double major programs; are seeking post-baccalaureate degrees, including education credentials or certificates; are non-resident students paying nonresident tuition; or qualify for certain categories of low-income student status, as defined in state law.

Costs for a Year at UC Davis

The costs listed in the chart below are average costs, and your own living expenses may differ somewhat from these. More information on living expenses can be found in the section on housing or obtained from the Financial Aid Office.

Average Student Costs Annually

Undergraduate

Fees	\$4,332
Books and Supplies	\$841
Housing	\$3,846
Food	\$1,919
Personal Expenses	\$1,413
Transportation	\$756
Total (off-campus residence)	\$13,107
Less for living on campus	\$275
Total (on-campus residence)	\$12,832

Graduate (Single, living off campus)

General	\$14,269
School of Law	\$14,369 to 16,544 (depending upon the year in school)
Graduate School of Management	\$16,249
School of Medicine	\$18,249 to 19,309 (depending upon the year in school)
School of Veterinary Medicine	\$16,753 to 16,811 (depending upon the year in school)

Employee-Student Fees

Reduced fees are available to UC career employees and certain UC retirees who are qualified for admis-

sion to the University. Once admitted, the employee-student must file a petition for the reduction in fees before each quarter of enrollment. Employee students pay one-third of the full-time Registration Fee, one-third of the full-time Education Fee, and the Memorial Union Fee. Employee students may enroll for up to nine units or three courses per quarter or semester, whichever is greater. Detailed information is in the UC Staff Personnel Policy Manual (Section 260.23 for employees, 775.7 for retirees, and 141.11 for the Administrative and Professional Staff program) available in department offices, at the Library Reference Center, or the Staff Development and Professional Services Office. Petitions can be obtained through the employee's unit.

Part-Time Students

Students approved for enrollment on a part-time basis are required to pay only one-half of the Educational Fee and one-half of the Nonresident Tuition Fee.

International Student Expenses

International students are responsible for all of their expenses while studying at UC Davis. The expenses include non-resident tuition, educational fees, room and board and a modest amount for personal expenses. For the 1994-95 academic year, we estimate the cost will be \$23,500. Because the exact cost for tuition and fees is not determined until just before the beginning of the academic year, \$23,500 is only a preliminary figure. This minimum allowance may be increased without advance notice.

During the admission process, most international undergraduate students are required to complete the Certification of Finances form certifying that funds are available for twelve months support. It is very important that students have adequate, reliable, and continuing financial support for the whole time they are here. After students arrive in the United States, it is extremely difficult to obtain additional funding. The University does not offer grants or financial aid to international undergraduate students.

All students need to be aware that there are numerous initial expenses during the first few months, including tuition and fees, an initial down payment for housing, food and personal expenses. We suggest that you bring a minimum of \$4,000 for immediate expenses. Careful budgeting is essential for international students.

Cancellation, Withdrawal, and Fee Refunds

If you registered for courses and wish to cancel your registration or withdraw from the University, you must complete a Notice of Cancellation/Withdrawal form. This form is available from the Office of the Registrar. Failure to do so may make you liable for fees according to the University refund policy (below). All of your courses will be dropped automatically when this form is processed.

New Undergraduate Students:

Prior to Day 1, Registration fees paid are refunded in full except for the \$100 acceptance of admission fee.

Day 1 and after, the \$100 acceptance of admission fee is withheld from the registration fee and the Schedule of Refunds is applied to the balance of fees assessed.

All Continuing and Readmitted Students and New Graduate Students:

There is a service charge of \$10 for cancellation of registration before the first day of instruction. After the first day of instruction the Schedule of Refunds is applied to the total of fees assessed.

Schedule of Refunds

The Schedule of Refunds below applies to all continuing and readmitted students and new students **who do not receive** federal financial aid.*

The Schedule of Refunds refers to **calendar days** beginning with the first day of instruction. Percentages listed (days 1-35) should be applied respectively to tuition, education fee, university registration fee, and other student fees. The effective date for determining a refund of fees is the date the student files an official notice of withdrawal with the University, and it is presumed that no University services will be provided to the student after that date.

University registration fee, education fee, nonresident tuition and other student fees**:

1-14 days	80%
15-21 days	60%
22-28 days	40%
29-35 days	20%
36 days and over	0%

* For new students who receive federal financial aid and withdraw during their first academic term, fees may be refunded according to a Modified Fee Refund Schedule, which is available at the Office of the Registrar.

**Refund Schedule subject to change.

Refund of Health Insurance Fee

If you paid the health insurance fee and you are cancelling your registration before the first day of instruction, you are entitled to a 100 percent refund of this fee. **Undergraduates** must contact the Health Insurance Office at (916) 752-2612 to receive the refund. **Graduates** will get an automatic refund from the Accounting Office.

After the first day of instruction, no refund of the health insurance fee will be issued. Any questions regarding the refund of health fees for withdrawals should be directed to the Student Health Center.

FINANCIAL AID

Information:
Financial Aid Office
113 North Hall
916-752-2390 (TDD 752-3244)

The Financial Aid Office provides financial assistance in the form of scholarships, loans, grants, and work-study employment.

Financial Aid Deadlines

Priority filing period for grants, loans, work-study, and California Student Aid Commission applications for 1995-96	Jan. 1-Mar. 2
Deadline to file for fellowships and graduate scholarships for 1995-96 with Graduate Studies	Jan. 15

Students who miss the March 2 deadline should still apply for financial aid. Even though Cal Grant, scholarship, and work-study funds may be depleted, eligible applicants can receive Pell Grants and Federal Stafford Loans to help meet their need. The Free Application for Federal Student Aid (FAFSA) is available at local high schools, community colleges, and the Financial Aid Office. Continuing UC Davis students and prospective graduate students should obtain the FAFSA from the Financial Aid Office in December.

Undergraduates with outstanding academic records are encouraged to apply for scholarships. See "Scholarships and Awards" at the end of this section for information about scholarship applications or contact the UC Davis Scholarship Office, 207 North Hall, 916-752-2393.

Graduate students are eligible for most of the same types of financial aid as undergraduates. In addition, graduate scholarships, fellowships, and teaching and research assistantships are administered through Graduate Studies. State graduate fellowships are awarded to students who are pursuing an advanced or professional degree and demonstrate financial need and academic eligibility. The awards pay part of the cost of tuition and are based on undergraduate grades, test scores, parents' educational level, and consideration of disadvantaged background.

Eligibility for most assistance is based upon demonstrated financial need. (Most scholarships are not based on need.) Eligibility is determined by the following formula: 1) the student is assigned a standard budget reflecting the average costs for a student attending UC Davis; 2) the student's resources are analyzed according to federal and state regulations; 3) the resources are subtracted from the budget, and the remainder is the amount of eligibility. The Financial Aid Office attempts to fill this amount with a combination of grants, work-study, and loans.

The awards for married students are based on the same basic budget plus the addition of a standard child care allowance, unless documentation is provided about a spouse who is unable to work, in which



case a dependent living allowance will also be awarded. Single parents' awards are based on the single student's budget and a child care allowance. If single parents' resources (earnings and benefits) are not sufficient to meet the basic living expenses of their dependents, a standard dependent living allowance may be awarded upon receipt of documentation.

Satisfactory Academic Progress. Federal regulations require that financial aid recipients meet the published Standards for Satisfactory Academic Progress for Financial Aid concerning units, grade point average, and maximum quarters of attendance allowed to obtain a degree. A copy of these standards is available at the Financial Aid Office, 113 North Hall. Review the policy in detail and discuss it with your academic adviser.

For more information, contact the Financial Aid Office. Regulations and deadlines are subject to change.

TYPES OF FINANCIAL AID

Grants

A grant is a gift that does not have to be repaid as long as the student remains eligible. Whenever criteria and funding levels permit, a student's financial aid award includes grants.

Federal Pell Grants. All undergraduate financial aid applicants are required to apply for a Federal Pell Grant each year by following the instructions in the financial aid application packet. Recipients must be enrolled at least half time and must maintain good academic standing and make satisfactory academic progress. Eligibility is determined by the federal government according to a formula developed by the Department of Education and approved annually by Congress. All applicants are notified via a "Student Aid Report" (SAR). Submit all parts of the SAR to the UC Davis Financial Aid Office. The amount you receive depends on your financial need.

Cal Grants are awarded by the California Student Aid Commission and may be renewed each year. All undergraduate financial aid applicants who are California residents are required to apply for one of these awards. Follow the instructions in the financial aid application packet.

Cal Grant A awards are based on financial need and academic achievement. Recipients must complete at least 36 units per academic year.

Cal Grant B awards are based on financial need and are for entering undergraduate students primarily from low-income backgrounds. Recipients are required to complete at least 12 units each quarter, unless the student receives permission to enroll for fewer units.

- Cal Grant A pays the full amount of registration fees.
- Cal Grant B pays a monthly stipend for living expenses for first-year students and a portion of the registration fees plus a monthly stipend for living expenses for students in their second through fourth years.

University Grants are available to both graduate and undergraduate students. The maximum varies each year depending on funds available.

Educational Opportunity Program (EOP) Grants are restricted to undergraduates.

Supplemental Educational Opportunity Grants are awarded on the same basis as University Grants. They are available to U.S. citizens or permanent U.S. residents who are at least half-time students and who demonstrate exceptional financial need while pursuing their first undergraduate degree.

Bureau of Indian Affairs (BIA) Grants are awarded to students who are at least one-fourth American Indian, Eskimo, or Aleut as recognized by a tribal group served by the Bureau of Indian Affairs and who show financial need. Applicants must submit a Free Application for Federal Student Aid (FAFSA) and provide supporting documents. Write to the agency that administers your tribal affairs and request a BIA Higher Education Assistance application. The BIA Financial Aid counselor on campus can help you complete the application.

- Amount of BIA grant depends on need and availability of funds at each BIA agency.

Loans

A Financial Aid Offer almost always includes a long-term, low-interest loan. Repayment of these loans (with the exception of the PLUS/SLS program) begins after you graduate or withdraw from school.

University Student Loans up to \$18,000 per student are available for graduate studies; payment may be deferred until completion or termination of studies. Cosigner is required for annual amounts above \$1,000.

- \$4,500 undergraduate maximum for first 2 years
- \$9,000 undergraduate maximum during 4 years
- \$18,000 maximum for graduate students, including loans for undergraduate studies
- 5 percent interest (subject to change)
- Repayment begins six months after graduation or withdrawal

Federal Perkins Loans are for U.S. citizens or permanent U.S. residents. Loans may be limited to a percentage of student's need because of demand and limited funds. Repayment starts six to nine months after graduation or withdrawal from school and may be extended over ten years. Additional deferments are possible for temporary total disability or volunteer service in a private, non-profit organization, VISTA, or the Peace Corps. Some teachers of students from low-income families and full-time teachers of handicapped children may also qualify for partial loan cancellation.

- \$3,000 undergraduate annual loan limit
- \$15,000 undergraduate maximum loan limit
- \$30,000 maximum for graduate students, including loans for undergraduate studies
- 5 percent interest (subject to change)

Health Profession Student Loans (HPSL) are awarded to students in the Schools of Medicine and Veterinary Medicine who demonstrate exceptional financial need. Parental income information is required for all applicants regardless of age and dependency status.

- \$2,500 plus fees maximum for veterinary medicine and first-year medical students

- \$3,333 plus fees maximum for medical students in the second, third, or fourth year of study
- 5 percent interest
- Repayment begins twelve months after receipt of the degree or withdrawal

The 1992 reauthorization of financial aid programs changed the eligibility requirement for HPSL for *medical* students. Beginning with the 1993-94 academic year, new HPSL borrowers must commit themselves to complete a primary care residency program, and practice in a primary care field until their HPSLs are repaid.

Federal Subsidized and Unsubsidized Stafford Student Loans (SSL) are available through banks and other lending institutions. Subsidized loans are based on financial need and interest accrued while the student is in school is paid by the federal government. Unsubsidized SSLs are available to students regardless of income and assets, and there is no interest subsidy. Students are advised to speak with a Financial Aid counselor before borrowing an unsubsidized loan.

- Undergraduate students may borrow up to annual maximums of \$2,625 for freshmen, \$3,500 for sophomores, and \$5,500 for juniors and seniors, up to a maximum aggregate indebtedness of \$23,000.
- Graduate and professional students may borrow up to \$8,500 per year, not to exceed a maximum aggregate of \$65,500 for combined undergraduate and graduate borrowing.
- Variable interest rate is adjusted annually, capped at 9 percent (new borrowers), 7-10 percent interest (previous borrowers).
- Repayment begins six months after graduation or withdrawal.

Parent Loans for Undergraduate Students (PLUS) are government-insured loans that are made to parents of dependent students.

- Parents may borrow PLUS up to the cost of education minus other financial aid received during the years the dependent students is an undergraduate.
- There is no interest subsidy for this loan.
- Repayment begins within 60 days after loan disbursement.

Short-Term Loans meet temporary or emergency financial needs of registered students. Loan funds are provided by UC Davis alumni, ASUCD, the Cal Aggie Foundation, the Regents of the University of California, and private donors.

- Emergency Loans: \$200 maximum; the maximum repayment period is 30 days.
- Short-Term Loans: \$300 maximum. The maximum repayment period is five months or the end of the academic year.
- Assistant Loans: graduate students who are in the teaching assistant, research assistant, associate-instructor, or postgraduate researcher classifications can apply for a maximum of one month's salary. The maximum repayment period is six months or the end of the academic year.

For information about how to apply, pick up an application in the lobby of North Hall. Application procedures vary slightly during the registration cycle of each quarter. Check the Short-term Loan bulletin board in the lobby of North Hall for instructions.

Work-Study

College work-study programs enable students to earn part of their financial aid through part-time employment. To participate, you must first receive work-study as a part of your financial aid package. Your work-study award offers you both money for your education and work experience. The Student Employment Center coordinates all college work-study programs.

Federal College Work-Study Program is funded by the federal government. Employment may be on or off campus with profit or nonprofit organizations. To be eligible, you must be a citizen or permanent resident of the U.S., carry at least a half-time academic course load, and maintain minimum academic progress.

California State Work-Study is funded by the state, and employment may be with profit or nonprofit organizations. The employment must be educationally beneficial or related to a particular career interest or the exploration of a career option. To be eligible, students must meet the requirements for federal student aid eligibility and be California residents.

University Work-Study is funded by the University of California, and employment is limited to jobs on campus. This program is primarily used for international students with financial need who would be ineligible for Federal College Work-Study.

The **Student Employment Center** helps students, including those on the Planned Educational Leave Program, and their spouses find both part-time and temporary full-time employment on and off campus during the school year and vacation periods. Job opportunities are available in many fields of interest and require skills ranging from entry level to highly technical. For further information, see "Student Employment" in the Student Life chapter of this catalog.

UNDERGRADUATE SCHOLARSHIPS AND AWARDS

Information:
Scholarship Office
207 North Hall
916-752-2393

UC Davis recognizes exceptional students with scholarships awarded on the basis of academic excellence and exceptional promise. The Scholarship Office administers approximately 150 different undergraduate scholarships. Many more scholarships are handled through outside agencies.

Scholarship recipients are chosen by committees made up of both students and faculty. In addition to academic records (a minimum grade point average of 3.25 is required), selection may be based on letters of recommendation, test scores, and a personal essay in which your University goals and objectives are stated. *Some awards are limited to students in specific majors or colleges, residents of certain geographical areas, students of a particular class standing, or students with*

demonstrated financial need. Most scholarships are not renewable and you must re-apply each year for scholarship aid.

Students applying to the University for the fall quarter are considered for scholarships using the same forms completed for admission purposes. Continuing students should obtain scholarship applications from the Scholarship Office in October. These applications are due in early December. Announcement of winners is usually made beginning in April.

Graduate students are also eligible for various scholarships and fellowships. (See the Graduate Studies chapter.)

Regents Scholarships, among the highest honors that undergraduates at the University can receive, are granted to exceptionally promising freshmen or juniors enrolling in the fall quarter. Awards may be honorary (a \$500 per year award) or may be accompanied by a stipend generally covering the difference between family resources and yearly educational costs. These scholarships are renewable as long as you maintain a 3.25 grade point average.

- Dollar amounts vary—up to full financial need
- 2-year and 4-year renewable scholarships

Alumni Scholarships, provided by the Alumni Association in cooperation with the University, are based primarily upon leadership and scholastic achievement. Your financial need and extracurricular activities may also be considered.

- \$1,000 maximum
- New undergraduates only
- Selection by local Alumni Association chapters

Military Scholarships are awarded to outstanding high school seniors without regard to financial need, as well as to UC Davis students who have demonstrated exceptional leadership and scholastic achievement during their freshman and/or sophomore years. Eligible high school seniors apply for the full 4-year scholarship and must file applications by November. UCD scholarship students participate in the Military Science (ROTC) Program. Information and applications are available from the Department of Military Science, 125 Hickey Gymnasium, 916-752-0543.

- Full fees, books and supplies
- \$1,000 per year for miscellaneous expenses
- 1-, 2-, 3-, or 4-year scholarships

Other Scholarships are made possible by individual donors, private corporations, and various agencies. Many organizations and groups conduct their own scholarship programs. In most cases, you apply directly to these sponsoring groups.

- Generally \$100 to \$3,200

Special Prizes at UC Davis recognize outstanding performance, achievement, and promise in special programs or majors. The most prestigious prize is the University Medal, presented to the most outstanding graduating senior.

- Plaques or certificates and cash awards
- College and school medals to outstanding graduates

STUDENT LIFE



LIVING AT DAVIS

Residence Halls

Information:
Student Housing Office
916-752-2033

You can expand your UC Davis experience and add a measure of convenience to your life by living on campus; some 3,500 undergraduates and 178 graduate students do just that. Students and professional staff in each of the residence hall complexes help create and maintain an environment conducive to personal growth and educational achievement. About 90 percent of the freshman students live in residence halls. Twenty-five percent of the transfer students elect to live in a residence hall environment. All new undergraduates whose Statements of Intent to Register (SIR) are received before July 1, 1994 are guaranteed residence hall housing as long as they complete all of the instructions that accompany their contracts. All graduate students whose applications are received on or before May 1, 1994, will participate in a lottery for the 178 spaces available in Lysle Leach Hall.

The total room-and-board rate for 1994-95 is \$4,980-5,640 for a double-occupancy room and \$5,510-6,170 for a single room (of which there are very few available to new residents). Cost depends on which of the six meal plans you choose. Rooms are furnished with a bed, desk and chair, bookcase, chest of drawers, study lamp, and bulletin board for each resident.

If the Davis campus is your choice when filling out your University Admissions Application, the Student Housing Office mails necessary housing information with your admissions letter. If you have a physical disability which requires special housing accommodation, please send a detailed letter of explanation to the Contracts and Accounts Office, Room 160, Student Housing Office, at the time you return your Statement of Intent to Register. Your housing contract will be mailed to you between April and July. At that time you will be able to choose your meal and payment plan.

Student Family Housing: Orchard Park/Solano Park

Information:
916-752-4000

There are 476 University-operated, furnished and unfurnished on-campus apartments for UC Davis student families. The monthly rates for the academic year 1993-94 were as follows:

- Orchard Park, two-bedroom unfurnished apartment, \$465.
- Orchard Park, two-bedroom furnished apartment, \$495.
- Solano Park, one-bedroom unfurnished apartment, \$366.
- Solano Park, two-bedroom unfurnished apartment, \$415.

Vacancies in Orchard Park/Solano Park are filled from a chronological list based on the date of application. For a fall assignment, you should expect a wait of two to three months after you apply. For an assignment during the remainder of the year, the waiting period is usually shorter. An application may be submitted

before you are admitted to the University and before you are married, but you must show documentation of your student and marital or parental status before occupancy can be granted. If a member of your family has a physical disability which requires special housing accommodation, please attach a detailed letter of explanation to your application.

Russell Park

Information:
916-753-7322

Privately owned and managed on-campus living accommodations are available for student families. Russell Park features one-, two-, and three-bedroom unfurnished units. Monthly rents for academic year 1994-95 range from \$470 for a one-bedroom unit to \$756 for a three-bedroom unit.

Other Graduate Student Housing

Information:
The Atriums
916-753-0659

The Atriums offers on-campus living accommodations for single graduate students. The *privately owned and managed* apartments feature studio and two-bedroom unfurnished units. For the academic year 1994-95, monthly rent for a studio is \$450 and \$628 for a two-bedroom unit.

STUDENT SERVICES

Student Health

Information:
Cowell Student Health Center
916-752-2300 (voice, and telephone device for the speech and hearing impaired)

Your health is important to you and to the University. Consequently, new students are asked to submit a medical history form, and evidence of rubeola and rubella immunity to the Health Center.

Since it is not intended that the Health Center supplant the medical care of your family physician, you are advised to have a physical examination by your own doctor before coming to UC Davis. Any problems capable of remedial treatment, such as diseased tonsils or imperfect eyesight, should be corrected to prevent loss of study time. Students with contagious diseases will be excluded from the classroom.

The services of the Health Center are made possible, in part, by your registration fees. As an enrolled student paying full registration fees, you are eligible to use the Health Center from the first day of the quarter through the last day of the quarter or to the date of official withdrawal. Some of the Health Center services and facilities are:

- General outpatient care
- Regularly scheduled clinics
- X-ray, laboratory, and pharmacy services
- Physical therapy
- Women's Clinic

The Health Center currently does not provide services for dental problems or routine eye care.

Health Center services are available to students' dependents on a fee-for-service basis. Also, you may purchase a Health Insurance Plan at the Health Center for your spouse and children.

Health Insurance. Graduate, professional, and international students must purchase a mandatory insurance plan as part of registration. Undergraduate students have an opportunity to purchase a voluntary plan during registration. For more information, you may call 916-752-2612 or visit the Insurance Office at Cowell Student Health Center, 8:00 a.m. to noon and 1:00 to 5:00 p.m., Monday, Tuesday, Thursday, and Friday, and 9:00 a.m. to noon and 1:00 to 5:00 p.m. on Wednesday.

Child Care Programs

Need help with child care? The following programs are available on campus and in the community to help you with child care arrangements and expenses.

- The Student Housing Office distributes child care publications, coordinates an information and referral network among campus units, and serves as the University's liaison with LaRue Park Children's House, Russell Park Child Development Center, and City of Davis Parks and Community Services/Child Care. For further information, contact 260 Student Housing Office, or telephone 916-752-5415.
- City of Davis Parks and Community Services/Child Care provides free resource and referral information and administers a variety of child care subsidies. The program is funded jointly by the University of California, Davis; the City of Davis; and the State Department of Education. The program maintains information on licensed family day care homes, day care centers, nursery schools, co-ops, playgroups, and other family-related services. Additional services include parenting workshops and handouts; a bi-monthly newsletter; a parenting resource library; and

a book, video, and toy lending library. It is located at 23 Russell Boulevard, 916-757-5626.

- The UC Davis Registration Fee Child Care Subsidy Program provides partial child care subsidies to full-time students. Spouses must also be attending school and/or employed full time. Special needs situations will be considered on a case-by-case basis. Eligibility is based on family income, with awards determined through a lottery. Parents may choose from licensed family day care homes and child care centers. For additional information, call City of Davis Parks and Community Services/Child Care at 916-757-5626, or drop by 23 Russell Boulevard.
- The Child Care Grant Program, funded through the State Department of Education and administered by City of Davis Parks and Community Services/Child Care, can help income-eligible families pay for child care costs through a variety of different subsidies. Eligibility requirements for the programs vary, but all parents need to be employed, in school, or seeking employment full or part time. All care is provided in Davis from a child care provider of the parents' choice. Parents may be required to pay a fee based on a sliding scale, and in some instances, an additional co-payment may be required. Admittance is based on income and priority guidelines set by the state and federal government. A waiting list is maintained for all programs, and applications are accepted year round. For information call 916-757-5626, or drop by 23 Russell Boulevard.
- The Financial Aid Office can assist students who are parents and who qualify for financial aid with allowances for direct child care costs (in-home provider or child care center charges). This office is in 113 North Hall, 916-752-2390.
- The Student Employment Center posts job listings of parents wishing to hire child care providers. This office is in 114 South Hall, 916-752-0520.



- LaRue Park Children's House and Russell Park Child Development Center are privately owned and operated child care centers on the UC Davis campus. Residents of Russell Park, Orchard Park, and Solano Park student family housing pay reduced rates. Information about LaRue Park Children's House, which serves infants through preschool-age children, can be obtained at 916-753-8716. Information about Russell Park Child Development Center, serving infants through school-age children, is available by calling 916-753-2487.
- The Early Childhood Laboratory is a teaching and research facility for the Human Development Program and Family Studies Unit. Four different programs accommodate children from the ages of six months to six years for three hours a day, following the UC Davis academic calendar. Student families pay lower tuition than do UC Davis staff, faculty, and community-affiliated families. Children are selected from a waiting list according to criteria designed to meet academic goals. The laboratory is located on campus, and the office is in TB 117, 916-752-2888.
- The Perfect Tender Infant Care Cooperative serves infants under twelve months of age whose parent(s) attend the School of Law. Contact 916-752-0243 for additional information.
- The Women's Resources and Research Center sponsors the Child Emergency Notification Service, intended to provide schools and child care providers with a means of contacting student parents in the event of a health-related emergency involving the child. Interested students must sign up for this service in person; this includes providing information that will assist a staff member in notifying the parent if she or he is in class at the time of the emergency. This service, available to single parents and others with special circumstances, is intended as a back-up if the child care provider cannot reach the primary emergency contact. The center is located in 10 Lower Freeborn, 916-752-3372.

Student Employment

Information:
Student Employment Center
114 South Hall
916-752-0520

The Student Employment Center helps students who are enrolled in a full-time or part-time degree program, students on PELP, students' spouses, and students with a letter of acceptance for the following quarter who have not yet registered.

Employment opportunities exist on campus, in the city of Davis, and in adjacent communities. Full-time, part-time, and temporary jobs are available during the school year and vacation periods. New listings are posted daily. Listings of employment opportunities for the summer with government agencies, camps, and resorts throughout California are located at the center. Students are encouraged to begin looking in January for summer jobs.

Offers of employment are conditional, subject to proof of identity and U.S. citizenship or your right to work in the U.S., as required by federal law (Immigration Reform and Control Act 1986).

The center is open from 9:00 to 11:45 a.m. and from 1:00 to 4:00 p.m.

Transportation and Parking

Parking. If you park a vehicle (including a motorcycle or moped) on the Davis campus you must have a valid parking permit or pay at a meter Monday through Friday between the hours of 7:00 a.m. and 10:00 p.m. Parking lots on campus are financed solely by fees collected from parking permits and meters. Daily permits are currently \$2.00 and may be obtained from permit dispensers located in lots 1, 2, 5, 25, 47, 47A, 49, 50, 54, and 81; daily permits for lots 2B and 30 are \$1.00. Long-term permits are required for all other parking lots, and may be purchased at the Transportation and Parking Services Office, located on Extension Center Drive directly south of lot 30 and the Rec Pool. For visitor parking information, please consult the South Gate Kiosk on Old Davis Road, or call Transportation and Parking Services at 916-752-8277.

Shuttles. The UCD/UCDMC Shuttle provides hourly service to the Medical Center in Sacramento. The shuttle operates Monday through Friday and is available to all members of the UCD community. The Intracampus Bus provides transportation between the Davis campus and the Berkeley campus for University employees, registered students, and other University affiliates. Call Fleet Services at 752-8287 for schedule information.

Buses. Unitrans, 13 bus lines operated by the Associated Students, serves the campus and city year round. Undergraduate students ride by showing a valid registration card. Others ride by paying a cash fare or purchasing tickets or passes at the Campus Box Office. Full service is provided each UCD school day (Monday through Friday) and Monday through Thursday night during the regular school year—fall, winter, and spring quarters. Reduced schedule bus service operates during the summer, finals week, and all academic break periods. Schedules are available at the MU Information desk, bus terminals, City Hall, and at the Unitrans office.

Ridesharing. UC Davis encourages ridesharing. For information on transportation alternatives to the Davis campus, call 916-752-MILE or visit the Transportation and Parking Services Office located on Extension Center Drive. Alternatives include carpooling and vanpooling (registered pools receive reduced parking rates as well as preferential parking), public transit, commuter match assistance, and shuttle systems.

RECREATION AND THE ARTS

No matter what your recreational bent—horseback riding, outdoor activities, listening to music, arts and crafts, bowling, swimming, or sports—the Davis campus has a place where you can enjoy it.

Facilities and programs such as the Equestrian Center, Craft Center, Outdoor Adventures, Recreation Hall, Intramural Sports, MU Art Gallery, Recreation Swimming Pool, or the MU Games Area will help you balance the academic demands at UCD with your leisure interests. A catalog of recreational activities is published quarterly, mailed to all residences in Davis, and distributed throughout campus. You may call 752-1770 to request a catalog.

Memorial Union and Campus Recreation

Information:
Memorial Union Programs and Campus Recreation
463 Memorial Union
916-752-1730

The **Memorial Union** (MU) complex, directly north of the Quad, serves as the community center for the campus. Bring yourself up to date on local events by stopping at the **MU Campus Information Center** on the first floor. The Information Center takes reservations for the use of tables and display boards in and around the MU. The center maintains an up-to-date database of 1,200 organizations and is able to refer you to people, places, programs and services both on and off campus. The goal is to save you the "run-around" so you can get the information you need quickly and conveniently. A valuable resource for current students as well as new students and visitors, the center can also be reached by telephone, 916-752-2222. Other first-level facilities include the UCD Bookstore, Corral gift shop, and Coffee House.

King Lounge, on the second floor, features music listening and periodicals in a comfortable and relaxed atmosphere popular for studying. The MU Art Gallery and a complex of meeting rooms, the MU II Conference Center, complete the second floor. In addition to the administrative offices of the Memorial Union and Campus Recreation, the offices of ASUCD, Student Leadership Center, and Student Judicial Affairs can be found on the third and fourth floors of the MU tower. Freeborn Hall is a 1,250-seat assembly hall used for dances, performing arts, banquets, lectures, and conferences. The Campus Box Office, where you can purchase tickets for campus events and cash checks, is outside Freeborn.

The **MU Art Gallery** and **Music and Periodicals Center**, adjacent to King Lounge on the second level of the Memorial Union, feature a changing series of contemporary and historical art exhibits throughout the school year. The gallery sponsors print sales, special programs, and lectures, as well as internships for those interested in career work in an art gallery or museum. The Music and Periodicals Center provides current periodicals for leisure reading and has a large library of music for your listening pleasure. Further information regarding these services may be obtained by calling 916-752-2885/1730.

The **Games Area**, located below the UCD Bookstore, is a recreational facility consisting of a bowling center, billiards room, video arcade, lounge, and storage lockers. The Games Area conducts bowling leagues, classes, clinics, and tournaments for all ages from beginning through advanced skill levels. The facility is fully accessible to those with disabilities. Call 916-752-2580/1730 for details.

The Memorial Union has several facilities that can be rented for group gatherings. With its rustic wood-paneled interior and ceiling-high windows, **Rec Pool Lodge** is an ideal location for meetings, lectures, or dances. The eaves-covered patio surrounding the lodge offers a lovely, shaded environment for outside dining during the warm weather months. Situated in the secluded Arboretum on the southwest perimeter of campus, **Putah Creek Lodge** provides a relaxing atmosphere for lectures, banquets, weddings, or



dances. The spacious lawn surrounding the lodge is available for a variety of activities like volleyball, receptions, and picnics. Additional lodge amenities include kitchens and outdoor barbecues.

Outdoor Adventures, located in the Barn on the corner of California and Hutchison, will help you develop your outdoor skills and plan your outdoor excursions. You can rent equipment of professional quality for your adventure. An up-to-date library contains topographic maps, trail guides, and other materials. Classes, excursions and clinics in backpacking, rock-climbing techniques, white-water rafting, kayaking, sea kayaking, mountaineering, cross-country skiing, and other sports are offered throughout the year. Group rates and custom-designed trips can be arranged. Many special activities such as wilderness emergency-care clinics, white-water river guide training, slide presentations, and programs conducted by outdoor experts are also held. Stop in and share your own outdoor experiences! For more information call 916-752-1995/1730.

The **Equestrian Center**, southwest of the Veterinary Medical Teaching Hospital off Garrod Drive, is active all year round, providing trail rides, practice sessions, and instruction in both English and Western riding. Group and private lessons are available for beginning through advanced levels, and trained volunteers can provide an educational experience for those interested in horse care and stable management. The Equestrian Center sponsors clinics, horse shows, summer equestrian camps, and special events, and also coordinates the Polo and Equestrian Clubs for student participation. Telephone 916-752-2372/1730 for further details.

The **Recreation Swimming Pool**, at the corner of La Rue Road and Hutchison Drive, is a large free-form pool with a separate wading pool, a bathhouse, shuffleboard courts, and an extensive grass area for sunbathing. The staff offers lessons to all age groups and arranges for special events such as "family nights." The pool opens for the season in April and closes in October. More information regarding the Rec Pool can be obtained by calling 916-752-2695 or 916-752-1995/1730.

The **Silo Union**, recently renovated to serve a variety of campus needs, offers food services, meeting/confer-

ence facilities, lounges, and the campus pub. If you would like to reserve space in the Silo for a meeting, social event or conference, contact Campus Events and Information at 916-752-2813.

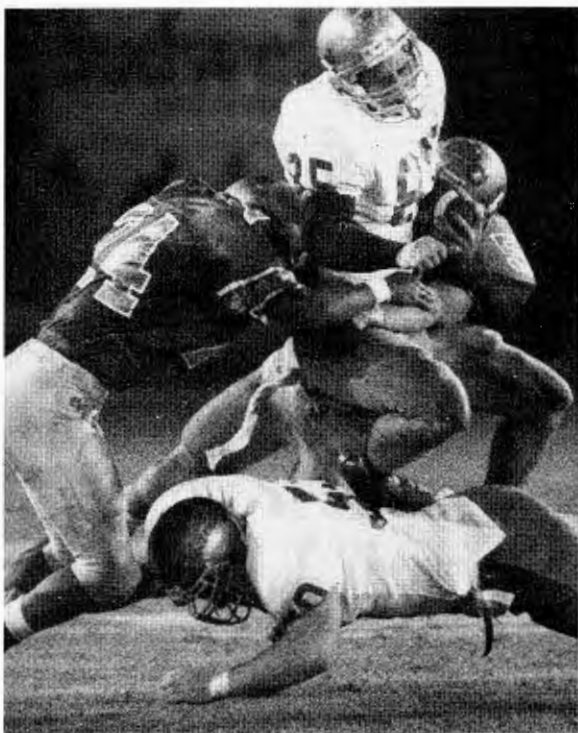
The **Craft Center** in the South Silo is an ideal place to channel your creative energy. Facilities are available on a drop-in basis, or purchase a pass for more frequent use of the equipment and work space. Workshops and classes are offered each quarter in such varied crafts as woodworking, weaving, jewelry-making, art and graphics, ceramics, photography, silkscreen printing, welding, leatherworking, and stained glass. Call for more information: 916-752-1475/1730.

The **South Silo** also houses the ASUCD Experimental College (916-752-2568), Student Special Services (916-752-2007), Graduate Student Association (916-752-6108), and a small branch of the Bookstore serving the School of Law (916-752-2961).

Recreation Hall

Information:
Entrance 1B
916-752-6073

Recreation Hall is a multi-use arena available for intramural and informal recreation play, intercollegiate athletic basketball and women's gymnastics, physical education classes, and sports clubs. Numerous special events sponsored each year by the campus and community are held in the 8,400-seat Recreation Hall. The tri-level facility has locker rooms; a flat running track; an equipment room; racquetball, wallyball, and squash courts; a weight room with free weights, universals, hydraulic machines, stair machines, rowing machines and bicycles; court areas for basketball, volleyball, and badminton; and areas for martial arts, table tennis, gymnastics, aerobics, and dance. The upper level north area has a state-of-the-art artificial rockclimbing wall for climbers of all skill levels. The Special Events Room can be reserved for meetings by calling the Campus Events and Information Office.



Undergraduate students can use Rec Hall facilities by showing their current, valid photo ID card. Graduate students must pay a \$5.00 per quarter activity fee. Students may also purchase a \$6.00 guest pass valid for three people. Non-students may purchase a privilege card at Rec Hall to use lockers, equipment, and facilities. Patrons may also purchase a daily pass at the 1B entrance. Rec Hall is open Monday through Thursday, from 6:30 a.m. to midnight, Fridays 6:30 a.m. to 10:00 p.m., Saturdays 9:00 a.m. to 6:00 p.m., and Sundays noon to 10:00 p.m. throughout the year. Rec Hall hours are shortened during quarter breaks and summer.

Recreation Hall is surrounded by an outdoor fitness cluster on Orchard Field, the tennis courts on La Rue Road, just north of the Rec Pool, and the volleyball and basketball courts west of the Segundo residence hall complex. While these courts are primarily for student use, they are also available to the general community. The courts cannot be reserved and are available on a first-come, first-served basis.

Intercollegiate Athletics, Intramurals and Club Sports

Information:
264 Hickey Gymnasium
916-752-1111 (Intercollegiate Athletics)
916-752-3500 (Intramurals and Club Sports)

Intercollegiate athletics, intramurals, and club sports programs provide organized sports competition and physical recreational activities across the broad spectrum of student physical abilities. The underlying objective is to offer a coordinated program of sports participation that meets student needs at every level of competence and depth of interest.

Although intercollegiate athletics at Davis is intended to benefit the campus by providing *esprit de corps*, its prime role is to provide personal development opportunities for as many non-scholarship student-athlete participants as facilities and resources permit. Currently, the program consists of varsity teams in eleven men's sports and nine women's sports. Membership affiliation is with the Northern California Athletic Conference and Division II of the National Collegiate Athletic Association. Approximately 1,000 students compete on varsity or junior varsity teams each year.

The club sports program includes both recreational and competitive offerings involving 37 sports with 1,400 participants per year, while the intramurals program provides competition in 36 sports and serves approximately 18,000 participants.

The Arts

Whether you want to participate, be entertained, or be inspired, an abundance of creative, musical, theater, art, design, and dance offerings are happening on campus all year long.

UC Davis Presents (916-757-3199), located at 200 B Street, Suite A, brings a wide variety of touring performing artists to UC Davis to serve both the campus and surrounding communities. During the academic year, UC Davis Presents offers concerts and recitals by classical, jazz, and folk music artists; drama; classical, modern, and ethnic dance; and lectures by eminent public figures. Various departments such as English, the foreign languages, and history sponsor lectures,

poetry readings, and exhibits open to the University community. Bulletin boards, kiosks, the student radio station KDVS, and the *California Aggie* inform audiences about upcoming events.

You'll find annual and quarterly brochures and promotional materials on all events sponsored by UC Davis Presents at the Campus Box Office and at the UC Davis Presents office. Tickets for UC Davis Presents events may be purchased at the Campus Box Office in Freeborn Hall, or any BASS/TM outlet.

Music

The Department of Music (916-752-5537) sponsors the UCD Symphony Orchestra, Chorus, Chamber Singers, Early Music Ensemble, Concert Band, and small ensemble groups. Music majors and other interested students can receive credit for participation in these groups, which perform at concerts and recitals open to the University community. The department sponsors the annual Theatre of Voices Festival and also an artist-in-residence for one quarter each year who gives concerts, recitals, and lectures. Free noon concerts featuring individual performers and ensembles—both professional musicians and music students—are a favorite weekly event during the school year. The UC Davis Contemporary Music Players and the UCD Faculty Woodwind Quintet are in residence on campus. The Department of Music sponsors nearly one hundred public concerts each year.

Drama

The Department of Dramatic Art has one of the best theater facilities in California. The excellent faculty and the Granada Artists-in-Residence program (which brings a major British director to the department each quarter); graduate students working on Master of Fine Arts (M.F.A.) degrees in acting; and an unusually good stock of scenery, props, costumes, and lighting equipment all contribute to the professional quality of Davis productions. Each year's drama schedule includes University Theatre Season (five major productions of established plays); Second Season (five smaller productions of established plays written by students); and dozens of class-related projects. These productions are part of the academic program of the department and serve an important purpose in the study of dramatic art. Participation is open to all students.

Art Galleries

A tour of all the UCD art galleries will take you from one corner of the campus to the other. The **Memorial Union Art Gallery** (916-752-2885) features a series of changing contemporary and historical art exhibits during the school year. Works by professional artists as well as students are on display for periods of six weeks.

The **Design Gallery** (916-752-4139) on the first floor of Walker Hall is known for its exciting exhibitions of design-related material. Changing presentations and installations of architecture, interiors, graphics, costumes, textiles, folk art and the annual Student Show and Picnic Day Exhibition reflect the interests of the design program. The Design Gallery is an innovative space where the installations are as interesting as the material presented. Hours during exhibition periods are noon to 5:00 p.m. Monday through Friday, 2:00 to 5:00 p.m. Sundays, and closed on holidays.

The **Richard L. Nelson Gallery** (916-752-8500), named in honor of the first chairperson of the Department of Art, was dedicated in 1976. Located on the first floor of the Art Building, the Gallery organizes regularly changing exhibitions of historical and contemporary works of art. The Gallery's program reflects and complements the teaching program of the Department of Art and provides aesthetic enrichment to the University community and the Northern California area at large. Hours during exhibition periods are noon to 5:00 p.m., Monday-Friday, and 2:00 to 5:00 p.m. Sunday. The **Fine Arts Collection** (916-752-8500) is located adjacent to the Nelson Gallery. Representing various historical periods and cultures, it is the Davis campus's major collection of art. Selected works are available for viewing weekday afternoons. The **Basement Gallery** is a student-directed gallery that exhibits artwork of advanced UCD art majors. The gallery is located in the Art Building. The exhibitions change biweekly throughout the academic year. Hours are 9:00 a.m. to 4:00 p.m. Monday through Friday. Gallery openings are Thursday evenings between 5:00 and 7:00 p.m.

The **C. N. Gorman Museum** (916-752-6567, Native American Studies), is located on the first floor in Hart Hall. The museum was established in 1973 in honor of Carl N. Gorman, artist, advocate, and former faculty member of Native American Studies. The museum features changing exhibitions of works by Native American and diverse artists. Selections from the permanent collection of art are also exhibited on a rotating basis throughout the year. Hours are noon to 5:00 p.m., Tuesday through Friday, and by appointment.

ASSOCIATED STUDENTS (ASUCD)

Information:
Executive Council Office
370 Memorial Union
916-752-3632
ASUCD Main Office
364 Memorial Union
916-752-1990

The Associated Students of the University of California, Davis (or ASUCD), authorized by the Regents and the Chancellor, represents all undergraduate students. Law and graduate students also currently have access to all ASUCD commercial activities. Funds allocated to ASUCD provide activities and services that will make life as a student a little easier, less expensive, or just more fun.

The student government budgets the allocated funds each year through its Executive Council. Based on the city council form of government, the Executive Council consists of seven elected council members and the Council President and Vice President. The Council is the policy-making body for ASUCD and supervises all aspects of the association. The Council President is the chief administrative officer for ASUCD and is assisted by the Vice President who serves as the executive aide. ASUCD is the liaison for the undergraduate student body and represents the students with other universities, the Universitywide administration, and the Regents.

Five **commissions** are subordinate advisory bodies of the Executive Council, and assist the governing board with its decisions by researching legislation and making recommendations. Commission chairpersons are

ex officio members to the Council. Each commission also involves itself with various projects that relate to their specific area.

- External Affairs deals with off-campus concerns (the Regents, UC Office of the President, etc.).
- Internal Affairs recommends policies to improve the quality of nonacademic student life on campus.
- Academic Affairs acts as an advocate to student rights in the area of academics, including dealing with the Academic Senate and with issues such as grading policies, tenure, and teacher evaluations.
- Business and Finance makes recommendations to the Executive Council on all financial matters.
- Ethnic and Cultural Affairs makes recommendations on policies and programs concerning UCD's ethnic community, for establishing liaison and achieving rapport with on-campus and off-campus bodies affecting ethnic students and their quality of life while at the University.

The **judicial branch** consists of two boards whose members are appointed by the Executive Council Chair.

- The Student Judicial Board is responsible for determining eligibility of candidates for elective office in ASUCD and interpreting and enforcing the ASUCD Constitution.
- The Student Appeals Board rules on appeals to Student Judicial Board decisions.

ASUCD operates more than forty activities and services for UCD students. Information about these services can be found in the *Student Directory*, which combines details about ASUCD services and organizations and the ASUCD student telephone directory, or by visiting the ASUCD offices in the Memorial Union.

Some of the services operated by the ASUCD for University students include the Unitrans bus system, *California Aggie* newspaper, the Bike Barn repair services, travel service, free legal advice for undergraduate students, convenience store, U.S. Post Office, and the Coffee House in the Memorial Union. The ASUCD-sponsored Experimental College offers a variety of non-traditional classes each quarter for students interested in diversifying their educational experience. Other ASUCD activities include Radio KDVS stereo 90.3 FM, Classical Notes and Campus Copies, *Housing Viewpoint*, Homecoming, Student Forums, Entertainment Council, Whole Earth Festival, and Picnic Day.

UC Davis Administrative Advisory Committees

Students may become involved in issues affecting the campus community by applying for membership on an Administrative Advisory Committee. Each committee advises on policies affecting campus life in a specific area, such as athletics, child care, disability issues, information technology, and registration fees.

The committees respond to requests for advice, identify needs or concerns within the charge of the committee, and recommend action to the administration. As members of an Administrative Advisory Committee, students can make sure that student perspectives are well represented in the Committee's recommendations,

and, in turn, learn more about faculty, Academic Federation, and staff views of campus issues. Applications are accepted each winter for service on committees the following academic year.

GRADUATE STUDENT ASSOCIATION (GSA)

Information:
Room 253, South Silo
916-752-6108; FAX: 916-752-5158; e-mail: gsa@ucdavis.edu

The Graduate Student Association (GSA) is the officially recognized student government for UC Davis graduate students. GSA is a representative assembly that provides a forum for addressing the concerns of graduate students and promotes communication with campus administrators. GSA also serves as an advocate at all levels of the university on behalf of graduate students. Funded by graduate student fees, GSA provides services to all academic graduate students and to professional students in the Graduate School of Management. Services include new student orientation, community housing listing service, legal service, fax service, travel awards, newsletters, and assorted social events. Other professional students are eligible to join the GSA by paying a fee.

GSA is run by graduate and professional students who devote time and expertise to the General Assembly, the Executive Council and committees. GSA General Assembly representatives are designated by other students in their department or graduate group. General Assembly meetings are held once a month and are open to all graduate and professional students. Each year the General Assembly elects the members of the Executive Council, who serve in a variety of positions to carry out the policies and functions of the organization. To find out what GSA can do for you, please call or visit the GSA office.

STUDENT LEADERSHIP CENTER

Information:
Student Leadership Center
4th Floor, Memorial Union
752-2027

There are over 300 registered student organizations at UCD, including cultural, social, religious, political, ethnic, academic, international, recreational, performing, residence hall, and service groups. The **Student Leadership Center** registers these diverse groups and provides advising on activities, resources, and campus policies. In addition to the subunits described below, the Student Leadership Center administers a number of campus programs: Danzantes del Alma folkloric dance troupe, Club Finance Council, activities faire, leadership training programs, College Bowl, and liaison to fraternities and sororities. Student Leadership Center staff assist individual students who want to become involved in activities or start new organizations. All students are encouraged to drop by the office to review the resources available to them.

Cultural Days is an annual series of programs celebrating the diverse ethnic cultures of the University community. Programs include African Continuum, Asian Pacific Cultural Week, Semana de la Raza, and the Native American Powwow. Everyone is invited to

share in these programs featuring speakers, workshops, films, entertainment, and family events.

The **Cal Aggie Marching Band** entertains spectators at athletic, campus, and community events. As one of the last remaining "student-run" bands in the nation, the band has a style and personality all its own. The **UCD Spirit Squad**, a group of talented and enthusiastic dancers, stunt team members, and gymnasts, travel and perform with the band.

JUDICIAL AFFAIRS

Information:
Student Judicial Affairs
4th Floor, Memorial Union
916-752-1128

Student Judicial Affairs supports the standards of the campus by responding to alleged violations of University policies or campus regulations. In addition, the office coordinates the informal resolution process and receives formal complaints for student grievances based on impermissible discrimination or harassment (sexual, racial, religious, handicap, etc.), or on violations of student rights to obtain access to or prevent disclosures from their campus records. The office aids in conflict resolution and can provide interpretations of University policies and regulations.

Student Conduct and Discipline

Students enrolling or seeking enrollment in the University assume an obligation to act in a manner compatible with the University's function as an educational institution. Rules concerning student conduct, student organizations, use of University facilities, and related matters are set forth in both University policies and campus regulations. Standards for student conduct are included in the *UCD Code of Academic Conduct*, in the *Student Activities Handbook*, in the *Guide to Residence Hall Life*, and in the booklet, *University of California Policies Applying to Campus Activities, Organizations, and Students*. The operation of the campus student disciplinary system is outlined in the booklet *UCD Administration of Student Discipline*. These policies and regulations are available from the Office of Student Judicial Affairs, 463 Memorial Union.

A summary of student conduct expectations is published each quarter in the *Class Schedule and Room Directory*. Misconduct for which students are subject to discipline includes, but is not limited to, plagiarism; cheating; knowingly furnishing false information to the University; sexual or other physical assault; threats of violence; possession of weapons; harassment, including "fighting words"; forgery; theft; vandalism; illegal possession, use, or sale of drugs or alcohol; hazing; obstruction or disruption of University activities or functions; and alteration or misuse of University documents, records, keys, or identification. Disciplinary sanctions which may be imposed range from a warning to dismissal, and may include restitution and/or assigned community service.

Alleged violations of campus or University standards should be referred to the Office of Student Judicial Affairs. If complaints cannot be resolved informally between Student Judicial Affairs, the accused student, and the referring party, the case may be referred to a

hearing before the Student Conduct Committee, Campus Judicial Board, or a hearing officer. The president of the University, through the chancellor, has ultimate authority for the administration of student discipline.

Student Responsibilities

You are responsible for complying with the announcements and regulations printed in this catalog and in the *Class Schedule and Room Directory*, published in the campus newspaper, and with all policies, rules, and regulations of the University and this campus.

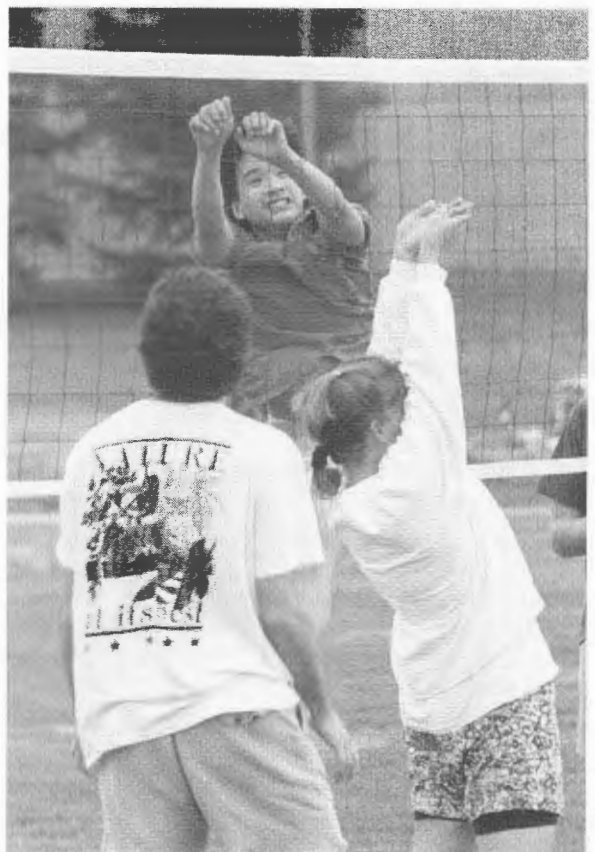
You will not be able to register or receive transcripts of record or diplomas until you have met all University obligations.

ALUMNI ASSOCIATION

Information:
Cal Aggie Alumni Association
Walter A. Buehler Alumni and Visitors Center
UC Davis
Davis, CA 95616-8517
916-752-0286
Toll free in California 1-800-242-GRAD

After graduation, you can maintain your ties with UC Davis and your fellow alumni by joining and participating in the Cal Aggie Alumni Association.

This worthwhile and vibrant organization sponsors a wide variety of activities and programs that support UC Davis and keep alumni in touch with the campus. Members are also entitled to special privileges. As a new graduate, your first year of membership is only \$20, a \$15 savings off the regular annual membership fee. For more information, call the alumni association or drop by the Alumni Center before you graduate.



ACADEMIC ADVISING AND STUDENT RESOURCES



ACADEMIC ADVISING

UC Davis offers many different types of academic advising to help you get the most from your education. College advisers can assist you in meeting degree requirements and taking maximum advantage of the resources available in the University. A conference at least once a quarter is especially desirable for students during their first year and for seniors during the final quarters preceding graduation.

College of Agricultural and Environmental Sciences

Office of the Dean

228 Mrak Hall
916-752-0108

The Dean's Office provides you with

- Staff advisers who can advise on University and College rules, regulations, and policies and procedures that affect students.
- Academic advising: in-depth advice regarding probation/dismissal status, admission to the College, readmission, and second bachelor's, limited, and regular status.
- Advice and action on petitions.
- Additional services include study plan clearance, College English requirement check, release of holds on registration packets, and final evaluation for graduation.

Academic Advising Center

Advising Center. Coordination of the College's Advising Center and the Summer Advising Program is available at the College's Academic Advising Center, 228 Mrak Hall.

Primarily, the Academic Advising Center advises students in the Exploratory Program. Advising for Individual Majors, as well as for other College majors and programs, is also available at the center.

Faculty Advisers/Staff Advisers. You will be assigned a faculty adviser to help you plan a program that corresponds to your individual educational interests. The Master Advisers coordinate advising within a major. Staff advisers located in the department can advise you on courses, specific requirements of majors, and career opportunities. You are strongly urged to consult with your faculty adviser or staff adviser each quarter before selecting your courses.

As educational objectives evolve, you may, in consultation with the Master Adviser for your major, choose a new faculty adviser whose area of expertise corresponds more directly to your specific objectives.

College of Agricultural and Environmental Sciences Undergraduate Programs

Major programs in the College of Agricultural and Environmental Science highlight the multiple connections among the environment, plant and animal systems, and human health and development, all within the larger context of the quality of life in the global economy. The following areas of study include majors with specific focuses:

Environmental and Resource Sciences and Policy majors focus on the broad facets of the human and natural environments and their interactions. These majors draw on the social, physical and biological sciences as needed to prepare students for leadership and advanced studies in the areas of natural resource management, environmental quality and stewardship, community planning and design, and public policy decision making.

Applied Behavioral Sciences
Atmospheric Science
Environmental and Resource Sciences
Environmental Policy Analysis and Planning
Environmental Biology and Management
Landscape Architecture
Soil and Water Science
Wildlife and Fisheries Biology (See Animal Biology area)

Plant Science majors provide students with a strong background in plant biology in the context of environmental systems and societal needs. The Agricultural Systems and Environment major couples a strong background in plant biology with an ecological understanding of food and fiber production systems. A wide range of options within the major allows students to focus on such areas as agricultural communications and education and sustainable agriculture. The plant biology major provides a basic background in all areas of plant biology, including plant development and protection, biotechnology, and post-harvest physiology.

Agricultural Systems and Environment
Plant Biology (with the Division of Biological Sciences)

Animal Biology major programs prepare students in animal biology and the management of environmental resources as needed to develop sustainable animal production technologies. Also considered is the impact of production and management processes on animal health and welfare, human diet and health, and the natural environment.

Animal Science
Animal Science and Management
Avian Sciences
Entomology
Wildlife and Fisheries Biology (see Environmental and Resource Sciences and Policy area)

Human Health and Development programs offer a wide assortment of curricula focusing on basic human needs (i.e., food, diet, clothing, and shelter) and human development. Together, these programs link the processing of food and fiber with consumer health and well-being. Emphasis is on the continuum between food/fiber production and consumer use—a continuum that includes a strong attention to product quality as well as to human needs and preferences. These majors also address the physiological, psychological, social and aesthetic dimensions of human health, comfort, safety, and the quality of life.

Agricultural and Managerial Economics
Community Nutrition
Design
Dietetics
Environmental Toxicology
Fermentation Science
Fiber and Polymer Science

Food Biochemistry
Food Science
Human Development
Nutrition Science
Textiles and Clothing

Collegewide Programs include those that cut across all of the above areas, providing students in a variety of majors with a background in such areas as public policy, economic principles in a global context, and the intersections among environmental, agricultural, and socioeconomic issues. Collegewide programs also include lower division curricula aimed at providing students with a foundational knowledge base and the potential for developing individualized programs.

Exploratory[†]
Individual Major
International Agricultural Development
Science and Society[†]

[†] These programs provide primarily lower division preparation and exploration; that is, they are not degree programs.

Associate Dean of Undergraduate Academic Programs

Annie King, Associate Dean
228 Mrak Hall
916-752-0108

The College has an associate dean of curricular and student affairs and advising staff who welcome the opportunity to become acquainted and to talk informally with individual students. They can also help you with academic problems if you are placed on probation or subject to dismissal.

Exploratory Program (non-degree program)

College Academic Advising Center:
228 Mrak Hall, 916-752-0610

Are you unsure what major you really want to pursue? If so, you may wish to register in the Exploratory Program. With the assistance of the College's Academic Advising Center and the major advisers, you will be able to explore specialization options, develop your decision-making abilities, and ultimately select the major best suited to your needs. A major must be declared before you complete 120 units (see Declaration of Major). For registration purposes, indicate "Exploratory" on your admissions materials.

College of Engineering

Undergraduate Office Advisers (1050 Engineering II). By contacting the Undergraduate Office, you may obtain information and assistance on academic, career, and personal matters, either through direct assistance by one of the staff members or through referral to other offices on campus. The Undergraduate Office handles student petitions, transfer evaluation, articulation, and degree certifications.

Faculty Advisers. You will be assigned a faculty adviser your first term on campus. Students in engineering usually retain the same faculty adviser throughout the undergraduate program, but you may choose a new adviser whenever you wish. It is necessary only to keep your departmental office informed of your adviser selection.

You are encouraged to meet individually with your faculty adviser at least once each quarter. Freshmen are strongly urged to do so each quarter of the first year of enrollment, and new advanced-standing transfers should meet with a faculty adviser for the first quarter.

To facilitate dialogue with your adviser on your program of study, use the Advising Worksheets. Copies are available in the Undergraduate Office. You should complete your Lower Division Worksheet early in your freshman year, have your adviser sign it, and then review it regularly with your adviser. Similarly, you should complete your Upper Division Worksheet early in your junior year, have it signed by your adviser, and then review it regularly with your adviser.

Departmental Staff Advisers. Faculty advising is supplemented in some departments by a system of staff advising especially designed for students in that department. Consult your departmental office for more information.

Peer Advisers. A well-developed peer advising system complements faculty and staff advising. Student advisers are available at Bainer Hall, Engineering II, and at other locations described in the Other Academic Advising section of this chapter.

College of Letters and Science

Office of the Dean/ Letters and Science Advising Office

Social Sciences and Humanities Building
916-752-0392

The associate deans and staff in the Letters and Science Advising Office can assist you with a wide variety of issues relating to your academic goals and experiences. You can consult the Advising Office on matters such as program planning, selection of a major, exceptions to regulations, and academic enrichment opportunities. The office also provides a number of additional services:

- Determines how your transfer credits from other institutions apply towards completion of breadth and unit requirements for the bachelor's degree (applicability of transfer credit toward the major is determined by your major faculty adviser)
- Provides degree checks to identify remaining College requirements
- Acts on petitions requiring the dean's approval
- Reviews the records of students who are subject to disqualification and determines whether such students may continue at UCD

Advising

Faculty Advisers. New students are assigned to a faculty adviser when the University receives their Statement of Intent to Register. If you indicated an interest in a particular program on your application, your adviser will be a faculty member associated with that major. If you change your major, you will be reassigned.

New students are encouraged to see their faculty adviser at least once every quarter during their first year on campus to discuss their educational goals, course program, and progress.

Continuing students who have completed three quarters in residence in the College should consult with an adviser at certain important checkpoint stages in their academic careers (below). They are urged, however, to maintain regular contact with an adviser in their major to avoid program errors that may delay graduation. Seniors should maintain close contact with their adviser in order to ensure that they are meeting the major requirements.

Academic Options Program. If you did not indicate an initial commitment to a particular major program on your application, you will participate in the Academic Options Program which provides academic advising to lower division students. You will be assisted by an advising team available in the Letters and Science Outreach Advising Offices located in each of the university residence hall complexes. Students living off campus are asked to contact the Letters and Science Advising Office early in the quarter to receive their adviser assignments.

Advising Checkpoints. You should consult with your faculty adviser at two, possibly three, critical stages in your academic career:

- Before you complete 90 units of degree credit, including transfer work, you must develop in consultation with your faculty adviser a proposal for a quarter-by-quarter program of courses showing how you will meet your educational goals and graduation requirements. You must also have declared a major by this time. Filing this plan with your adviser does not preclude subsequent modifications of the plan or a change of major.
- When you complete 135 units of degree credit, including transfer work, you should obtain Degree Check materials from the Letters and Science Advising Office and consult your adviser concerning course selection and satisfaction of requirements in the major.
- Before you complete 195 units of degree credit, including transfer work, you must develop in consultation with your faculty adviser a firm study plan, in the form of a quarter-by-quarter program that will satisfy all remaining degree requirements as expeditiously as possible. This plan will be filed with your adviser. If the plan indicates that you will have to register beyond the 225-unit limit in order to meet degree requirements, you must contact the Letters and Science Advising Office immediately. Exceptions to the 225-unit limit are granted by the dean only rarely. Typically, approval is granted only to allow completion of *minimum* degree requirements.

If you have not met with your faculty adviser before these established checkpoints, a hold may be placed on your registration materials as a reminder.

Peer Advisers. Student-to-student advising is an important part of the University advising services. The College of Letters and Science student assistants to the dean are available during regular office hours in 150 Mrak Hall to talk with students about their academic concerns.

Division of Biological Sciences

The Division of Biological Sciences Office

66 Briggs Hall
916-752-0410

The associate dean and staff in the Division of Biological Sciences Office can assist you with a variety of issues including PELP, withdrawal, part-time status, change of major, and some financial aid forms.

This office is also responsible for the academic progress of all students majoring in the division. If you have any problems (personal, medical, financial) that are affecting your academic performance, or if you are on academic probation, make an appointment to see one of the advisers in the division office.

Sections and Advising Centers

Students entering or intending to declare sectional majors in biochemistry, plant biology (botany), genetics, microbiology, physiology, or zoology should contact the specific section office for academic advising services. Students selecting the biological sciences major should contact the Division of Biological Sciences Office for academic advising services.

OTHER ACADEMIC ADVISING

Academic Peer Advising

Academic Peer Advising (APA) places peer advisers in over 45 departments to help students find the answers to their questions about major requirements, courses, and University regulations. The academic peer adviser complements faculty advising by providing a student perspective on the department. The Academic Peer Advising staff is trained to provide information and assistance concerning graduate schools, career opportunities, and college requirements. For more information contact the main APA office in 107 South Hall, 916-752-3000.

The First Resort

The First Resort is a place to go if you are feeling bogged down by University red tape, registration procedures, course selection, choosing a major, or other general advising questions. The student advisers here can either answer your questions or put you in contact with others who can. The staff can give you advice and assistance from the point of view of someone who has "been there." The First Resort maintains a tutor listing and referral service, a listing of courses of 1 to 3 units, and other valuable resources. Pre-graduate school information is available, and graduate school bulletins and other supplemental materials on hand are useful in selecting a graduate program. If you have a problem, remember—start with The First Resort, open from 9 a.m. to 4 p.m. throughout the academic year. (Temporary Building 98, across from the Chemistry building, 916-752-2807 for information or 916-752-3323, the advising hotline.)

Orientation and Summer Advising Office

The Orientation and Summer Advising Office coordinates the Summer Advising and Registration Program, Fall Quarter Orientation activities, and many other student assistance and orientation programs for new stu-

dents. The staff will introduce you to the campus environment, procedures, and opportunities, and offers programs relevant to students' changing needs. Your contribution to orientation programs, through ideas and assistance, is always welcome. The coordinator's office is located in 107 South Hall, 916-752-3000.

Advising Services

The **Pre-Graduate School Information and Referral Service** is a program available through Advising Services to assist students interested in M.A., M.B.A., Ph.D., or teaching credential programs. Specific services include help in locating graduate school programs in specific fields, completing application forms and statements of purpose, and planning financial options. This unit also coordinates the Undergraduate Research Conference, an annual event open to all undergraduate UC Davis researchers. Advisers are available through the main Advising Services office, 107 South Hall, 916-752-3000.

The **Pre-Law Advising Office** is where students interested in the legal profession can come for information. The staff can advise you about admission requirements and program planning. The office maintains a reference library of law school bulletins, legal assistant information, admission test materials, and general career information. Students can get more information on preparation for law school and a legal career through the many seminars and workshops held each year. You may contact one of the pre-law advisers in 107 South Hall, 916-752-3009.

The **Health Sciences Advising Office**, 106 South Hall (916-752-2672), will be an important place for you if you are preparing for a profession in the health science area. The professional staff and student advisers can provide information on requirements, application procedures, professional school curricula, and related options. The office maintains an extensive library of school catalogs, statistics, and books and journals related to health education.

Educational Opportunity Program/Student Affirmative Action (EOP/SAA)

Information:
313 North Hall
916-752-3472

The Educational Opportunity Program/Student Affirmative Action Information Office serves EOP/SAA students by assisting them with their academic, social, and personal adjustments to the University environment; coordinates EOP/SAA new student orientation programs; and serves as liaison to staff, faculty and administrators. The office's multicultural peer staff is particularly sensitive to differing social, cultural, and ethnic concerns. In addition, those students interested in pursuing the "helping" professions can receive training and experience through the Peer Adviser Counselor training program.

EOP/SAA Information Office services are also accessible at various outreach locations throughout the campus such as the Colleges of Agricultural and Environmental Sciences, Letters and Science, and Engineering; Learning Skills Center; The House; and all ethnic studies departments. All students are invited to telephone or stop by the EOP/SAA Information Office on the third floor of North Hall or any one of the

outreach locations to find out more about the peer counseling services.

ACADEMIC HELP

Learning Skills Center (LSC)

Information:
The Basement, South Hall
916-752-2013

At the Learning Skills Center you can receive assistance in a wide variety of areas, including:

- General study skills
- Math/science study skills
- Writing essays and term papers
- Reading efficiency
- English as a second language
- Time-management skills
- Test-taking skills
- Test anxiety reduction and more

The center also provides individual tutoring sessions for students on academic probation or subject to dismissal. Group and drop-in tutoring are available to all students.

Learning specialists can assist you individually, or you may participate in workshops covering specific areas of study. The Learning Laboratory has self-help tapes and films that enable you to work at your own pace. The LSC library contains a variety of programmed instructional materials, reference books, preparation materials for the GRE, MCAT, and LSAT exams, and a file of course examinations given in past quarters. Most materials may be checked out.

The Learning Skills Center is open Monday through Friday, 8 a.m. to 5 p.m. Come in and ask about our services, which are free to all UC Davis students.

EOP/SAA Tutoring

Information:
Learning Skills Center
The Basement, South Hall
916-752-2013

EOP/SAA tutoring is a free service for EOP and affirmative action students. If you are having difficulty with your coursework, the Learning Skills Center offers tutoring in most course areas. Tutoring is provided in groups and on a drop-in basis. For students in academic difficulty, pre-arranged one-to-one tutoring is also available. Although primary emphasis is on the assignments in your classes, tutorial services may also be used to improve study habits and learning skills. The tutoring program is staffed by students carefully selected for both their knowledge of course content and their sensitivity to the needs of students being tutored.

Special Transitional Enrichment Program (STEP)

Information:
Learning Skills Center
The Basement, South Hall
916-752-2013

New EOP/SAA students (freshmen) admitted by special action are expected to participate in the Special Transitional Enrichment Program (STEP). Selected reg-

ularly admitted EOP/SAA students are encouraged to do so. The program begins in summer and continues through the first academic year, providing preparatory coursework and developing academic skills. It helps students adjust academically and socially to the campus by strengthening their learning skills and study habits, and by providing an extensive orientation to campus life.

Learning Resource Centers

Information:
Student Housing
Jennifer Jo Lickiss
916-752-1736

Learning Resource Centers are located in the Segundo, Tercero, and Cuarto residence hall areas. They offer the following services to all residence hall students: PC computer terminals (IBM clones and Macintosh) and assistance, a reference library, language tapes, study skills sheets, an exam file, and a quiet place to study.

RESOLVING ACADEMIC PROBLEMS

The Grievance Process

Discrimination/Harassment. If you believe that you have been discriminated against or harassed, you may contact the office of Student Judicial Affairs (see below) or the ASUCD Grievance Center (see below) for information and assistance. Advice is also available from the campus's Sexual Harassment Information Line (916-752-2255). Graduate students may contact Graduate Studies (752-0650) and/or the Graduate Student Association (752-6108).

Grade Changes. If you believe you received an incorrect grade due to a clerical error, ask your instructor to file a grade change form with the Registrar's Office. If you believe you received an incorrect grade due to any type of discrimination, consult the office of Student Judicial Affairs (see below).

Other Grievances. If you need a requirement waiver or any other type of variance, contact your faculty adviser or the appropriate dean's office for information on your college's procedures. If you cannot get satisfaction through normal channels, contact the ASUCD Grievance Center or the Committee on Student-Faculty Relationships (see below).

ASUCD Grievance Center

Information:
ASUCD Academic Affairs Office
376 Memorial Union
916-752-6101

The ASUCD Grievance Center advocates students' academic concerns to the faculty and administration. Grievance counselors deal with students one-on-one, directing them to appropriate channels through which to state their grievances (i.e., student-faculty relations, sexual harassment, grade change problems, pre-judicial treatment in the classroom, and problems with academic procedure and policy). Students can get counseling, referrals, and support to aid in the resolution of these matters.

Committee on Student-Faculty Relationships

Information:
Academic Senate Office
356 Mrak Hall
916-752-3920

If students with a grievance feel they cannot get satisfaction through normal procedures, they may contact the Committee on Student-Faculty Relationships for assistance. The committee is advisory and can make recommendations to the office having authority to resolve the problem. It may also meet informally with the students involved with the grievance.

Student Judicial Affairs

Information:
Student Judicial Affairs
4th Floor, Memorial Union
916-752-1128

Student Judicial Affairs supports the standards of the campus by responding to alleged violations of University policies or campus regulations. In addition, the office coordinates the informal resolution process and receives formal complaints for student grievances based on impermissible discrimination or harassment (sexual, racial, religious, handicap, etc.), or on violations of student rights to obtain access to or prevent disclosures from their campus records. The office also can aid in conflict resolution and provide interpretations of University policies and regulations.

STUDENT SERVICES

Counseling Center

Information:
219 North Hall
916-752-0871

The Counseling Center offers confidential psychological, psychiatric and peer counseling services to students having problems that affect their academic progress and sense of well-being. The center's staff offer assistance for personal and interpersonal issues such as relationships, family, stress, cultural differences, assertiveness, self esteem and intimacy. Additionally, staff provide assistance for educational/vocational concerns such as coping with university life, academic performance, test anxiety, reentry adjustment and determining life goals. Services for relationship issues are also offered to students and their parents.

Walk-in services are available daily for students needing immediate assistance. Short-term individual counseling, group counseling, and assistance with off-campus referrals are provided. Career interest testing, personality testing, and information about graduate school admissions tests and the Planned Educational Leave Program are available.

Services are free to all registered students. Confidentiality is strictly maintained in accordance with state laws and ethical standards. Students, faculty or staff who are concerned about a student or desire consultation or assistance in making a referral are encouraged to call the center. To make an appointment, telephone or come to the Counseling Center.

The House

Temporary Building 16
24-Hour Hotline: 916-752-2790
Business Line: 916-752-5665

Located in a green, two-story house next to the Housing Office, The House is a professionally managed peer counseling program of the Counseling Center. Students receive confidential support, information, and referrals regarding personal or social problems. Well-trained student volunteers assist students through individual peer counseling and a wide variety of workshops and support groups held in an informal setting. No appointment is necessary and services are offered on a drop-in or telephone basis. The House is open seven days a week and is wheelchair accessible. Volunteers for peer counselor positions at the House are accepted each quarter. Students are trained in basic counseling skills and can receive units for training. Transcript notation is also available for quarters working as a peer counselor volunteer.

Health Education

Information:
Cowell Student Health Center
916-752-9652

Health education programs listed below are administered by Cowell Student Health Center.

Because maintaining good health is vital for the successful pursuit of your educational goals, the Health Education Program provides information and services through five programs. Trained peer counselors, health educators, workshops, and resource libraries are available through:

BikeRight—Bicycle Safety and Injury Prevention Program (916-752-8812)—Information on topics such as bicycle safety, equipment, laws, injury prevention and discount coupons for bicycle helmets.

Campus Alcohol and Drug Abuse Prevention Program (CADAPP) (916-752-6334)—Individual assessments, six-week small group education courses, and workshops on alcohol/other drug-related problems as well as issues of dysfunctional families and addiction. CADAPP includes two components: **Peer Counselors in Athletics**, an athlete-to-athlete substance abuse prevention and health education program, and **SESAP** (Student Educators in Substance Abuse Prevention).

Student Educators in Substance Abuse Prevention (916-752-DRUG or 752-3784)—Information, peer counseling, and resource referrals for students dealing with substance abuse issues of their own, or of their friends or family members. Programs and materials on responsible hospitality and non-alcohol party planning options.

Health Advocates (916-752-9651)—Information on personal nutrition, exercise, stress management, wellness issues, and many other topics is available. Students may also receive free individual computerized dietary analysis and peer nutrition counseling.

Peer Counselors in Sexuality (916-752-1151)—Information and peer counseling (in person or by phone) on birth control, pregnancy, sexually transmitted diseases (including HIV/AIDS), safer sex, healthy relationships, sex roles and other issues related to sexuality.

International Student Services (S.I.S.S.)

Information:
Services for International Students and Scholars
300 South Hall
916-752-0864

The S.I.S.S. Office assists international students throughout their programs of study at UCD, providing orientation and personal and cultural advising. S.I.S.S. also provides information and assistance regarding immigration regulations and helps students maintain their legal status while at UCD.

All new and transfer international students are required to attend a special orientation program that is held just before fall quarter registration. The orientation will help new students with registration, class enrollment, making housing arrangements, immigration regulations, and finding campus services and community resources.

Students must report to Services for International Students and Scholars as soon after their arrival as possible. S.I.S.S. can help new international students with their immediate needs, and familiarize them with the Davis campus and community. S.I.S.S. will introduce students to the Davis international community, and help them locate other individuals from their home countries.

Lesbian, Gay, and Bisexual Resource Center

Information:
Temporary Building 206, Room 128
916-752-2452

The Lesbian, Gay, and Bisexual (LGB) Resource Center offers a safe, supportive environment for people to learn more about lesbian, gay, and bisexual concerns and to meet other members of the Davis community. The center has a wealth of information and resources about lesbian, gay, and bisexual issues. Students who are studying or researching lesbian, gay, or bisexual issues are encouraged to use the center's resources. The center can also serve as a meeting place for local organizations or support groups. Call the center to reserve this space. The center's resources include:

- A library of books and literature on topics ranging from domestic partnership issues to lesbian humor. Many of these books are available for personal use. Local and national newspapers and magazines are available, including *The Advocate*, *Mom Guess What*, and *The Latest Issue*.
- A resource database and files on all of the local resources, including health professionals, legal services, clubs, organizations and community contacts.
- A bulletin board exchange, where community members may advertise special events, services, etc.

The LGB Resource Center is staffed by volunteers and serves all members of the Davis community. Open hours are Monday–Friday, 2:00 to 6:00 p.m.

Rape Prevention Education Program

Information:
Fire and Police Building, Kleiber Hall Drive
916-752-3299

The goal of the Rape Prevention Education Program (RPEP) is to explore myths and expose the realities of sexual assault. Focusing on prevention through educa-

tion, the program reaches out to the UCD community in a variety of ways. Services include the following:

- Free discussions and workshops for student groups and classes on topics such as rape prevention and safety awareness, sexual harassment, acquaintance rape, men and rape prevention, media images of women, pornography, and dating violence
- Seven-week self-defense classes for women, offered quarterly
- Tear gas certification classes
- Short-term counseling, referrals, and support groups for victims of rape or sexual assault, and for incest survivors
- Training for peer counselors and professionals
- A circulating library of books, videos, and articles on sexual assault and related issues
- Quarterly newsletter, *Freeing Our Lives*
- Call RPEP for drop-in hours or to make an appointment

RPEP has student work-study positions, and a volunteer staff. Contact RPEP if you have questions.

Women's Resources and Research Center (WRRC)

Information:
10 Lower Freeborn
916-752-3372

The Women's Resources and Research Center brings attention to and challenges the barriers that inhibit the inclusion, equal power, and advancement of women. The center promotes an understanding of the evolving roles of women and men, and helps women develop their full potential. To this end, the WRRC provides the UCD community with a women's studies library, information and programs on the educational, career, and personal needs and interests of women.

The center encourages you to drop by and talk with our friendly, knowledgeable professionals and student interns. Student internships are available in legislative work, graphics, library, editing and program planning.

Student Special Services

Information:
160 South Silo
916-752-2007

Student Special Services coordinates a variety of programs and services to meet the special needs of students as described below.

Disability Resource Center

Information:
Disability Resource Center (DRC)
160 South Silo
916-752-3184 (voice) or 752-6TDD (Telephone Device for the Deaf)

The Disability Resource Center (DRC) serves students who find their disability is a barrier to achieving academic or personal goals. Most often this occurs as individuals begin UCD, get established in the community, set up class support, seek personal/social outlets or plan career/personal changes. DRC provides information concerning campus as well as community resources, and provides specialized support not available elsewhere.

DRC was founded with a strong commitment to improving individual choices, personal control of essential

resources, and integrated participation in campus life. All University students are assumed to have similar needs, but the consequences of a disability may include some specialized requirements. Therefore, we work closely with each student in identifying his or her particular needs.

Academic and mobility resources for registered students with verified permanent or temporary disability-based needs include the following:

- Alternative educational materials, including large-print and taped textbooks
- Disability management counseling
- Emergency wheelchair repair
- Facilitation of access to all campus programs
- Registration assistance and priority registration
- Maintenance of a list of personal care attendants
- Peer support groups
- Reader and notetaker services
- Referral for special parking
- Referral for tutoring
- Referral to on-campus and off-campus resources, services and agencies
- Shuttle service (on-campus)
- Sign language, oral interpreting, and transliterating services
- Special adaptive equipment and computers

The campus is flat, with a good network of bicycle paths, curbs cuts and pedestrian walkways. Almost all instructional, recreational and student facilities are wheelchair accessible. Accessible on-campus housing is available and an accessible bus system links the campus and the community of Davis.

Preadmission counseling is available for persons with disabilities. You are encouraged to contact DRC if your disability has affected your ability to meet academic requirements for admission.

Reentry Student Services

Information:
Reentry Student Services
160 South Silo
916-752-2005

The Reentry Student Services Office assists students who have reentered the university after several years of life and work experience. The office provides admissions assistance, information, orientation, and peer support. It also provides referral assistance through the Reentry Resource Network composed of representatives from existing student services units, colleges, and divisions (e.g., from the Women's Resources and Research Center, Financial Aid, Student Housing, the Dean's Offices, etc.). In addition, the office sponsors special programs for new reentry students and assists members of Advocates For Reentry Students.

Transfer Student Services

Information:
Transfer Student Services
160 South Silo
916-752-2200

The Transfer Student Services Office assists students who have transferred from other institutions of higher education. The office coordinates transfer student matters among existing student services units to ensure students an easy and smooth transfer to the Univer-

sity. It also sponsors special receptions and workshops for new transfers and publishes an annual *Transfer Guide* of available campus services.

Veterans Affairs

Information:
Veterans Affairs Office
160 South Silo
916-752-2020

The Veterans Affairs Office assists veterans, dependents of deceased or disabled veterans, and reservists through a variety of federal, state and campus programs. The office certifies course attendance to the Veterans Administration, coordinates a tutorial assistance program, provides advice and support, and helps with employment, work study and financial aid concerns.

To initiate a benefit claim, write or drop by with your letter of admission. The office can give you the forms, information and advice to process your claim.

INTERNSHIPS AND CAREER SERVICES

Internship Programs

Information:
The Internship and Career Center
2nd floor, South Hall
916-752-2855

You can take advantage of one of the hundreds of organized internships through the Internship and Career Center or initiate your own.

An internship may be full time or part time, credit or non-credit, voluntary or involving a stipend—depending on your needs and interests and the availability of openings. Internship experiences must emphasize learning rather than routine activities, and include field supervision by a qualified professional and, where appropriate, the faculty member responsible for giving credit. Academic credit is awarded only for experiences planned and approved in advance by the sponsoring faculty member.

The Internship and Career Center

Information:
2nd floor, South Hall
916-752-2855

If you are an undergraduate, graduate, or alumnus, ICC can assist you in (1) identifying your abilities and interests, and relating them to jobs; (2) gaining access to practical experience to increase your competitiveness in the job market; and (3) finding out how and where to look for the jobs you want. If you are considering dropping out of the University for a term or longer, an adviser can also give you information about internships and employment opportunities.

The Howe Career Resources Library contains material that can aid you in learning how your major field of study can be translated into job opportunities, as well as data concerning types of employment graduates have obtained (summarized by academic major). Useful to job-seekers—and available free of charge—is ICC's *Placement Manual*, which provides guidelines for preparing a resume, tips on being interviewed, and information on employment in government, business, and education.

To assist students in finding jobs after graduation, the office solicits and maintains job vacancy listings, arranges employment interviews, and schedules on-campus recruiting by employers.

Education and Graduate Placement Services

Information:
The Internship and Career Center
2nd floor, South Hall
916-752-0724

Any student enrolled in the teaching credential program or pursuing a master's or doctoral degree in order to teach should register with the Education and Graduate Placement Office. Services include the following:

- Teaching job vacancy listings
- Placement files (professional dossiers)
- Special workshops on writing teaching resumes and curriculum vitae, and on preparing for interviews
- Individual advising

Advisers maintain contact with school district personnel and work with undergraduate students to explore teaching through internships. In addition, the office sponsors the Graduate Career Options Program for advanced degree candidates originally planning a teaching career and now considering other career options.

Human Corps Program

Information:
The Internship and Career Center
227 South Hall
916-752-3813

Human Corps is the student community services program at UC Davis. Public service work can be a rewarding and satisfying experience that may also improve a student's qualifications for the job market. Community service may or may not be compensated through wages, academic credit or transcript notation, and can take many forms, from a one-day activity to a long-term commitment.

The goal of Human Corps is to facilitate student involvement in community service by serving as a referral center for students wishing to perform community service and as a resource for agencies and campus units with service opportunities.

The Human Corps office contains a database and numerous service directories with information about non-profit agencies in California, community service opportunities throughout the world, and finding employment in the non-profit or public sectors after graduation. Students will also find the Human Corps community service database at the MU Campus Information Center.

ACADEMIC INFORMATION



REGISTRATION

Information:
Office of the Registrar
124 Mrak Hall
(916) 752-2973

Registration is the means by which you become a student at the University. The registration process includes registering for classes via *RSVP*, the telephone registration system (752-7787); paying fees and other financial obligations; and completing and filing informational forms. Every UCD student must register *each* quarter.

If you are a *new* or *reentering* student you must also:

- Have a photo ID picture taken.
- Submit a Statement of Legal Residence (see Appendix).
- Return the completed Medical History form, evidence of rubella immunity, results of a tuberculin skin test, and the Insurance Information Request form. These forms are mailed to each new student from the Student Health Center.

New graduate students who have been registered previously at Davis as undergraduates are considered to be new students.

Late registration privileges extend through the tenth day of instruction, but you will be assessed a fee of \$50 to defray the extra clerical costs of late registration. Permission to register after the deadline will be allowed only under conditions where action or inaction on the part of the University delays registration. A recommendation from an appropriate administrative unit will be required, and the registration fee must be paid with cash, cashier's check, credit union check, University check, or fee credit.

Change of Name. Petitions to change your name on official University records may be obtained from the Office of the Registrar. (Students planning to graduate should file this petition no later than the fifth week of the quarter in which they intend to graduate.)

Change of Address. Be sure to inform the Office of the Registrar of any change of address. Important registration materials, information, and announcements are mailed to students throughout the year, so keep your campus/local mailing address, your billing address, and your permanent address up to date. Change of Address forms are available at the Office of the Registrar.

REGISTERING FOR COURSES

The *Class Schedule and Room Directory*, available several weeks before the beginning of each quarter, gives class meeting times and room numbers, changes to the *General Catalog*, and the most up-to-date information on registration procedures, including *RSVP* (telephone registration).

Class Level

Undergraduate classification is determined by the number of quarter units you have completed:

Class	Unit Breakdown
Freshman	0.0— 44.9
Sophomore	45.0— 89.9
Junior	90.0—134.9
Senior	135.0—

Undergraduate Courses

Lower Division Courses

These courses, **numbered 1-99**, are open to all students for lower division credit, but are designed primarily for freshmen and sophomores.

Upper Division Courses

These courses, **numbered 100-199**, are open to all students who have met the necessary prerequisites as indicated in the catalog course description. Preparation should generally include completion of one lower division course in the given subject or completion of two years of college work.

Variable-Unit Courses

Subject to approval by the department chairperson, an instructor may arrange to give a special study course (numbers 90X, 92, 97T, 97TC, 98, 99, 190X, 192, 194H, 197T, 197TC, 198, 199) to interested students.

- **90X/190X (Seminar)** are seminar courses for in-depth examination of a special topic within the subject area.
- **92/192 (Internship)** courses enable individual students to obtain practical experience to complement their educational goals or to explore potential career interests and opportunities. Students must have completed 84 units before enrolling in course 192.
- **97T/197T (Tutoring) and 97TC/197TC (Tutoring in the Community)** are courses for students desiring to tutor in a subject in which they are proficient—generally in their major field—while enrolled as an undergraduate.
- **98/198 (Directed Group Study)** courses are set up on a one-time basis for a group of students in a subject for which no regular courses have been established.
- **99 (Special Study for Undergraduates)** is a course arranged for an individual student who shares with an instructor an academic interest that cannot be accommodated within the formal course structure.
- **194H (Special Study for Honors Students)** courses are for individual students with honor status, as determined by the department offering the course, and who have completed 84 units.
- **199 (Special Study for Advanced Undergraduates)** courses are the upper division counterparts of course 99, and involve supervised independent study and research requiring adequate background in the subject proposed for study as well as prior completion of 84 units.

Credit in courses 99, 194H, 199 is limited to a total of 5 units per term.

Autotutorial Courses are courses in which students instruct themselves at their own pace. These courses can be identified by the letters AT on their course numbers, e.g., 13AT, 141AT.

Research Conference Courses are courses in which advanced undergraduate students may participate in critical discussions of staff research activities. These one-unit courses are numbered 190C and are graded on a Passed/Not Passed basis.

Graduate Courses

Courses **numbered 200–299** are open to graduate students and to undergraduates who have completed 18 units of upper division work basic to the subject matter of the course. However, admission is subject to the approval of the instructor in charge of the course. Grading in 290C courses and variable-unit 299 or 299D courses is Satisfactory/Unsatisfactory.

Professional Courses for Teachers and Nurse Practitioners

Courses **numbered 300–399** are teacher-training courses in the Division of Education and in other departments and are especially intended for teachers or prospective teachers. Included are courses designed to provide instruction to teaching assistants. Also included are courses for certification of family nurse practitioners and physician assistants. These courses are open only to students enrolled in those programs.

Other Professional Courses

Courses **numbered 400–499** are professional training courses. Graduate students should consult their faculty adviser or contact the Graduate Studies Office before registering in 400 series courses to determine if graduate credit may be awarded for the course in question.

Prerequisites

Prerequisites for courses should be noted carefully; the responsibility for meeting these requirements rests on the student. If you can demonstrate that your preparation is equivalent to that specified by the prerequisites, the instructor may waive these requirements for you. However, the prerequisite that requires that you complete 84 units before registering in the course may not be waived.

Adding or Dropping Courses

You are officially registered in all courses listed on your individual study list. You will be held responsible for completing each of the courses. To confirm the courses on your official study list, call *RSVP*. You may adjust your schedule by adding or dropping courses via *RSVP* until the published deadlines.

After published deadlines, permission to change your study list may only be granted by the dean of your college or school and only in special circumstances. Certain fees may apply. Graduate students must have their adviser's approval in order to drop courses. A course that is on your study list and for which you did no work that could be graded is reflected on your official transcript by the notation "E-NWS" (Enrolled-No Work Submitted).

See the Academic Calendar in the front of this catalog for the deadlines each quarter to add or drop courses. The *Class Schedule and Room Directory* for each quarter explains how to use *RSVP* to add and drop courses, and what add/drop procedures and fees apply after the published deadlines.

Retroactive Drops

Occasionally, in exceptional circumstances, students are allowed to drop a course after the course is completed. Reasons for seeking a retroactive drop are very specific: medical problems, severe emotional difficul-

ties, or death or severe illness in the immediate family. Petitions are available from the Office of the Registrar and should include a detailed account of the problem, appropriate documentation, and an adequate explanation of why an "I" grade or late drop was not taken during the quarter in which the problem occurred. The instructor's signature is required on the petition. A \$3.00 fee is applicable on all retroactive drops.

Retroactive Adds

In some rare circumstances, students are allowed to add a course after the course is completed. Petitions for retroactive adds are available from the Office of the Registrar. Each petition must include the reason for the student's failure to add the course during the quarter in which it is offered. The petition must be supported by the instructor's signed approval, together with a statement from the instructor indicating knowledge of the student's participation and performance during the presentation of the course in question and the instructor's understanding as to the reason for the student's failure to add the course before the end of the quarter. A course grade must be assigned by the instructor. A \$3.00 fee is applicable on all retroactive adds.

COURSE LOAD

Certification of Full-Time Status. Undergraduate students must carry a study load of at least 12 units (including workload units) each quarter in order to be certified as full-time students for insurance and financial aid purposes, or to compete in intercollegiate athletics. Graduate students must carry a study load of at least 8 units each quarter in order to be certified as full-time students for insurance and financial aid purposes.

Minimum Progress Requirements. Minimum progress is defined as an average of 12 units (including workload units) passed per quarter, calculated at the end of every quarter for the preceding three quarters of enrollment. Undergraduate students falling below this required average will be subject to academic disqualification. Minimum progress requirements do not apply to students who have part-time status or to students who have their dean's approval to carry less than the minimum progress load because of medical disability, employment, a serious personal problem, a death in the immediate family, or an accident.

College of Letters and Science. Freshman students in their first year and transfer students in their first quarter of residence may not take more than 17 units each quarter. For all other Letters and Science students, the study list may not exceed 21 units each quarter. These unit limitations include non-credit remedial courses and repeated courses, but not make-up work to remove incomplete grades.

PART-TIME STUDENT STATUS

If, for reasons of occupation, family responsibility, health, or, for one term only, graduating senior status, you are unable to attend the university on a full-time basis, you may qualify for enrollment in part-time status. Students may change status between full-time and part-time as their circumstances change. To be considered eligible, undergraduate students must be reg-



istered in ten units (including workload units) or fewer per quarter, and graduate students must be registered in six units or fewer per quarter. Minimum progress requirements are waived for part-time students. Undergraduate petitions are available at the Office of the Registrar and require approval by the Registrar. Graduate petitions are available at Graduate Studies and approved by the Dean of Graduate Studies. Part-time students have use of the same facilities and are eligible for the same services, including Student Health Services, as full-time students.

ACADEMIC CREDIT

Academic work at the University is measured by "units of credit." In conjunction with the letter grade you receive from the course instructor, units of credit give a fairly accurate evaluation of the amount of time you have devoted to a given subject. Units of credit also make it possible to anticipate the amount of work involved in a particular course, and enable you to transfer from one campus or university to another without undue difficulty. (To convert quarter units to semester units, multiply by 0.66; from semester to quarter units, multiply by 1.5.)

Units of credit are assigned to courses based on the "Carnegie unit," which assigns one unit of credit for three hours of work by the student per week. Usually this means one hour of lecture or discussion led by the instructor and two hours of outside preparation by the student. In laboratory courses, two or three hours of work in the laboratory are normally assigned one unit of credit.

In most courses at Davis the standard procedure prevails, so that a three-unit course meets for three hours a week, a four-unit course for four hours, and so on.

Courses that are an exception to this pattern may require additional class time or give more demanding assignments. If you have questions about the number of units assigned to a course, you should check the expanded course descriptions (if your college or department provides them) or ask the instructor what is required in terms of outside reading, term papers, problem sets, or field trips. These are not always spelled out completely in the *General Catalog*. By knowing the amount of work that will be required, you can plan your course load more systematically and realistically.

Credit by Examination

Under certain prescribed conditions, currently registered students in good standing may receive course credit by taking an examination without formally registering in a course. You may obtain a petition and a copy of the prescribed conditions from the Office of the Registrar. The petition is subject to the approval of the instructor giving the examination and the department involved.

The completed petition, accompanied by a fee of \$5.00, must be presented for final approval to the dean of your college or school, or if you are a graduate student, to the dean of Graduate Studies.

The credit received for the examination may not duplicate any credit you have already earned toward your degree. You may not use credit by examination to repeat any course you have taken previously, regardless of the grade you received in that course. The final results will be reported to the Office of the Registrar, which will assign you the appropriate grade and grade points. Since failure to pass the examination will be recorded as an F, you are encouraged to prepare fully for such an examination before attempting it.

You may also receive credit for learning in nonacademic settings through credit by examination.

Concurrent Credit from Another Institution

A student may not obtain transfer credit for courses taken at a non-University of California campus in a term during which the student is registered as a full-time student at UCD. A variance can be obtained only by petitioning the dean of your college well in advance of the desired registration. When a variance is granted, units earned are counted toward minimum progress for the term in which the dual registration occurs. Summer session courses are exempt from this regulation.

Students may gain credit for courses taken during the summer at other institutions, provided the courses parallel those given in the University of California. Assurance that such credit will be accepted, however, can be given only after the courses have been completed. You should arrange to have the transcripts of your summer session grades sent to the Admissions Office for evaluation.

See the Summer Sessions bulletin for detailed information.

THE MAJOR

Declaration of Major

College of Agricultural and Environmental Sciences. Students must declare a major by the time they have completed 120 units. Failure to declare a major at this point will result in a hold on your further registration. In order to declare a major, you must meet with your faculty adviser and/or Advising Associate, fill out a Declaration of Major petition obtainable at the Office of the Registrar or Dean's Office, and file the petition with the Dean's Office. If you have completed 120 units you must prepare a study plan with your adviser and/or Advising Associate at the same time. You are accepted into a major only after your major department and the Dean's Office have approved the Change of Major petition. You'll find a complete list of the majors offered at UC Davis in a chart at the front of this catalog.

College of Engineering. Students must declare a major when they apply to the College of Engineering. Their freedom to change majors thereafter may be limited.

College of Letters and Science. Students must declare a major by the time they have completed 90 units. If you have not declared a major by this point, a hold may be placed on your registration materials. Such a hold would be removed only when your Declaration of Major petition is filed in the Dean's Office. Petitions can be obtained from faculty advisers, department offices, or the Office of the Registrar. As a part of the declaration procedure, you must, in consultation with a faculty adviser, prepare a projected plan of study. You are accepted into the major when your adviser and the dean have approved the petition.

To be accepted into a major, you must have a C average in all courses you have completed that are a requirement for that major, as well as a C average in the upper division courses you have taken toward the major. With the approval of the College Executive Committee, additional requirements, such as completion of a particular set of required courses with a specified

grade point average (usually well above a C average), may be introduced as conditions for acceptance into any major at any time.

If your performance is unsatisfactory after you have declared a major program, you may be required to withdraw from that major by the dean, upon written recommendation from the chairperson of the department or the curriculum committee that administers the major.

Change of Major Within a College

To change from one major to another within a college, you will need the consent of the department or committee in charge of your proposed new major. Admission into a major program may be denied by the program or by the dean if your grade point average in courses required for the selected major is less than 2.0.

Procedures for change of major within a college are the same as for declaration of major and the same conditions apply. If you wish to change to a major that has admission restrictions, you must comply with the special procedures and requirements for that major.

Except under unusual circumstances, no change of major will be permitted after you attain senior standing (135 units). It is not possible to change or declare a major in the quarter you complete your degree work.

College of Engineering. The above provisions do not apply to students in the College of Engineering, whose freedom to change majors is limited.

Change of Major Accompanied by Change of College

Petitions for a change of major involving change of college must be filed within the first five weeks of the quarter. A change petition, available at the Dean's Office and Office of the Registrar, must be endorsed by a faculty adviser of the new major you are selecting and signed by the dean of the college from which you wish to transfer. In addition, admission to the new college will require that dean's approval. Permission to transfer from one college to another may be denied or deferred if you are in academic difficulty or have a GPA of less than 2.0 in courses that are required by the new major.

College of Engineering. You may submit petitions for a transfer into the College of Engineering from another UCD college **only** if you (1) are in good academic standing and are making minimum progress; (2) have completed at least 40 units as a registered student on the Davis campus; (3) have successfully completed Mathematics 21A, 21B, and 21C and Physics 9A (or their equivalents) on a letter-grade basis; (4) have a minimum GPA of 2.5 in all mathematics and physics coursework in the Mathematics 21 series and Physics 9A and above; and (5) have the minimum UC GPA specified for the year in which you wish to transfer. Additional restrictions may apply to students who want to major in Civil Engineering, a currently impacted major.

You must declare a specific major at the time you petition to transfer and must have the minimum GPA specified for transfer into that major in that year. Consult the Engineering Undergraduate Office for details on minimum GPAs for transfer to specific majors.

Multiple Majors

College of Agricultural and Environmental Science.

Because of similarity in course requirements for many of the major programs in the College, requests for multiple majors are not normally approved. If you are interested in two or more areas of study, you should consider the options of planning an individually designed major, or of adopting one or more of the minor programs offered by the College to complement your major. If you complete two majors, you may also petition for recognition that you have completed all the requirements for study of a major in addition to your selected major. At least 80 percent of the upper division units used to satisfy course and unit requirements in each major selected must be unique and not duplicate those of the other major. In planning for multiple majors, you should determine the total requirements needed for each major as well as for graduation from each college involved.

College of Engineering. Enrollment in combinations of engineering majors other than the established double majors or in an engineering major and a non-engineering major may be possible. A change of major petition is required; this should be filed in the Undergraduate Office and is subject to approval. Double-major students must satisfy the requirements for both majors. Degree requirements for such double majors ordinarily cannot be completed within four academic years.

College of Letters and Science. Students choosing to major in multiple subjects must notify the Dean's Office of their decision by submitting for approval a petition endorsed by faculty advisers in the majors. The dean's approval of the declaration of more than one major is subject to the following conditions:

1. At least 80 percent of the upper division units used to satisfy course and unit requirements in each major selected must be unique and may not be counted towards the upper division unit requirements of any other major undertaken. Courses with substantial overlap in content will not count as part of the 80 percent.

If the major programs differ in the number of upper division units required, the major program requiring the smaller number of units will be used to compute the minimum number of units that must be unique.

2. At the time of request, a substantial part of the preparatory subject matter and at least two upper division courses in each major must have been successfully completed.

It should be possible to complete all degree requirements within the 225-unit limit.

Combination proposals that *cannot be approved* are two or more majors

1. in the following group: biochemistry, biological sciences, genetics, microbiology, physiology, plant biology (botany), and zoology;
2. offered by the same discipline, *except* art history and art studio.

A student who completes all requirements for approved multiple majors in which one major normally leads to an A.B. degree and another normally leads to a B.S.

degree, will receive a B.A.S. degree. A single degree is granted to students who graduate with multiple majors.

Cross-College Majors

College of Agricultural and Environmental Sciences.

The College does encourage multiple majors between colleges whenever your academic interests and abilities indicate this to be the best route. After endorsement of the Change of Major petition by the appropriate faculty in the colleges involved, each dean may approve the petition if there are sufficient differences between the requirements for the major programs you wish to study. At least 80 percent of the upper division units used to satisfy course and unit requirements in each major selected must be unique and not duplicate those of the other major. In planning for multiple majors, you should determine the total requirements needed for each major as well as for graduation from each college involved.

College of Engineering. Enrollment in a combination of an engineering major and a non-engineering major may be possible. A change of majors petition must be filed in the Undergraduate Office and is subject to approval. Such double-major students must satisfy the requirements for both majors. Degree requirements for such double majors ordinarily cannot be completed within four academic years.

College of Letters and Science. The same conditions apply for cross-college majors as for multiple majors. Cross-college programs will not be approved if the majors involved are available within a single college as well. For example, cross-college programs between the Colleges of Letters and Science and Agricultural and Environmental Sciences will not be approved if one of the majors is biochemistry, biological sciences, genetics, microbiology, physiology, plant biology (botany), or zoology.

Individual Major

Students with academic interests not covered by an established major have the opportunity to develop an individual major. Such a major requires the selection of interrelated courses totalling a minimum of 45 upper division units from two or more areas of study. If you choose this option you will work closely with faculty advisers to develop a coherent and rigorous academic program. This program is then submitted to a faculty committee for review and approval. Submit the proposed program to the committee *at least four quarters before you plan to graduate*. If you wish to undertake an individual major, request the appropriate forms from your dean's office. Program requirements are outlined under Individual Major in the Programs and Courses section of this catalog. The College of Engineering does not offer an individual major.

THE MINOR

If you are interested in two or more areas of study, you should consider completing one or more minor programs. Minor program requirements are listed in the Programs and Courses section of this catalog under the department that offers them. You will find a complete list of the minors offered at UC Davis in a chart at the front of this catalog.

A minor consists of 18 to 24 units in upper division courses specified by the department or program offering the minor. **At least half of these units and courses must be completed in residence on the Davis campus.** You are also expected to complete all courses that are prerequisite to the upper division courses. In order to request certification of a minor, **you must have a grade point average of 2.0 in all courses required for the minor.** At most, one course used in satisfaction of your major may be applied to your minor. If you elect more than one minor, these minors may not have any courses in common.

If you want to have completion of a minor certified on your transcript, you must obtain a minor petition from your dean's office and file it no later than the deadline for filing for graduation. You can elect only one minor in a subject area. Requirements for the minor must be met by the time of graduation.

No minors are available in the College of Engineering, although students in Engineering may, with the consent of their advisers, develop minors in either the College of Letters and Science or the College of Agricultural and Environmental Sciences. A minor is not required and may not be used to substitute for approved Humanities and Social Sciences (HSS) electives. The Undergraduate Office in the College of Engineering has the primary responsibility for certifying minors for engineering students and should be consulted before you begin the minor sequence.

If you are enrolled in the College of Engineering but elect a minor in either the College of Letters and Science or in the College of Agricultural and Environmental Science, you must pick up a minor petition in the office of the college that offers the minor you want, and have it certified by the Undergraduate Office of the College of Engineering.

EXAMINATIONS

Midterms

In undergraduate courses for which a midterm examination is required, each student has the right to take the midterm (or submit the take-home examination as opted by the instructor) during one of the regularly scheduled meetings of the class as published in the *Class Schedule and Room Directory*. The scheduling of a midterm examination at a time other than a regularly scheduled class meeting requires mutual consent of the instructor and each student registered in the course. A student who does not consent in writing to the different time must be permitted to take the examination (or submit the take-home examination) at the officially scheduled time. A student who consents in writing to the change of examination time waives the right to take the midterm at the officially scheduled time.

Final Examinations

Scheduling. The *Class Schedule and Room Directory* lists the times that final examinations are to be held. These are set up according to the day-and-hour periods in which the classes are given during the quarter. This information is available in the *Class Schedule and Room Directory* each term so that you can avoid final examination conflicts.



The scheduling of an examination at a time other than the specified time requires the mutual consent of the instructor and each student registered in the course. Any student who does not consent in writing to a different time must be permitted to take an examination (or submit the instructor-opted take-home examination) at the officially scheduled time. A student who consents in writing to a change in the final examination time waives the right to take the examination as originally scheduled. Departures from the published examination schedule should be carried out so as not to disadvantage students who are unable to accept the alternate schedule. An in-class final examination may not be rescheduled for a date earlier than the first day of finals week. The due date for a take-home final examination may not be earlier than the time and date published in the *Class Schedule and Room Directory*. A student who is improperly denied the right to take a required final examination on the published date (or submit the take-home examination as opted by the instructor) may file a petition with the Executive Council of the Davis Division of the Academic Senate by the end of the next regular term for appropriate action.

Requirements. Except under certain specified circumstances, Academic Senate Regulations require that final examinations be given in all undergraduate courses. Final examinations may be given in graduate courses. Exceptions to the regulation would be independent study courses, courses which consist of laboratory work only, and courses in which the examination has been waived (course descriptions will include the statement, "no final examination").

At the instructor's option, the final examination may be completely or in part a take-home examination. The writing time (in undergraduate courses) of a take-home and an in-class final examination together should not exceed three hours. In each course in which a final examination is required, the students have the right to take the final examination (and/or submit the take-home examination) at the time published in the *Class Schedule and Room Directory*.

An instructor may release each student's original examination, or a copy, at any time. Otherwise, the instructor will keep the exams, or copies thereof, until the end

of the next quarter and students may pick up their exams during this period.

Disabilities. Students with learning disabilities may have additional time for examinations (or alternate examination formats). An adjustment request must be submitted in writing to the instructor of the course involved by the tenth day of the quarter, and must include proof of the existence of a learning disability. The instructor determines, in consultation with the student and the campus learning disability specialist, whether an adjustment is necessary and specifies the terms of the adjustment.

Religious Observances. The University of California, Davis seeks to accommodate any student who, in observance of a religious creed, encounters an unavoidable conflict with a test or examination schedule. It is the responsibility of the student to provide, in writing and at the beginning of the quarter, notification of a potential conflict to the individual responsible for administering the test or examination and to request accommodation. Instructors will consider such requests on a case-by-case basis and determine whether such conflicts can be resolved without imposing on the instructor or the other students in the class an undue hardship which cannot be reasonably avoided. If so, the instructor will determine, in consultation with the student, a time during which the student can take the test or examination without incurring a penalty or violation to the student's religious creed.

GRADES

Every instructor is required to assign a grade for each student registered in a course. The following grades are used to report the quality of a student's work at UCD:

- A, *excellent*
- B, *good*
- C, *fair*
- D, *barely passing*
- F, *not passing (work so poor that it must be repeated to receive recognition)*
- P, *passed (grade C- or better)*
- NP, *not passed*
- S, *satisfactory*
- U, *unsatisfactory*
- I, *incomplete (work is satisfactory but incomplete for a good cause)*
- IP, *in progress*
- E-NWS, *enrolled—no work submitted*

The grades A, B, C, and D may be modified by a plus (+) or minus (-).

Grade Points

Grade points are assigned each letter grade as follows:

4.0=A+	2.3=C+	0.0=F
4.0=A	2.0=C	0.0=I
3.7=A-	1.7=C-	0.0=P/NP
3.3=B+	1.3=D+	0.0=S/U
3.0=B	1.0=D	
2.7=B-	0.7=D-	

Grade Point Average (GPA)

The grade point average is computed on courses taken at the University of California, with the exception of

courses taken in University Extension. The value of grade points over units attempted determines your grade point average. The grade point balance represents the number of grade points above or below a C average. The grades IP, P, S, NP, and U carry no grade points and are not included in grade point computations. Incomplete (I) grades are not included in the GPA at the end of the quarter, but are counted as F in determining if a bachelor's degree candidate has earned the minimum 2.0 GPA required for graduation.

A student at Davis is expected to maintain a C (2.0 GPA) or better in all work undertaken in the University. If you fall below a C average, you are considered "scholastically deficient" (see Probation and Dismissal).

Passed/Not Passed (P/NP) Grading

Subject to regulation by the faculties of the colleges and schools, an undergraduate student **in good standing** can request to take specific courses on a Passed/Not Passed basis. Such requests must be submitted and confirmed before the end of the fifth week of instruction.

The grade P is assigned for a grade of C- or better. Units thus earned are counted in satisfaction of degree requirements but are not counted in determining your grade point average.

The intent of this option is to encourage exploration in areas in which you have little or no previous experience by alleviating grading pressures. **The maximum number of units graded P that will be accepted for degree credit is one third of the units completed in residence on the Davis campus.** Consequently, at least two thirds of the units completed in residence at Davis and presented in satisfaction of degree requirements must be in courses taken for a letter grade.

In specific approved courses instructors will assign only Passed or Not Passed grades. Such courses count toward the maximum number of units graded P allowable toward the degree. If you are planning to take courses on a P/NP basis, you should also familiarize yourself with the requirements of your particular school or college which may have introduced conditions or restrictions in addition to the University requirements. If you plan to attend graduate or professional school, you should consult with Advising Services regarding Passed/Not Passed grading.

If you elect the P/NP grading option for courses graded upon completion of a two- or three-quarter sequence (In-Progress grading), a petition must be submitted before half of the time covered by the IP grading has elapsed. The P/NP grading will then be in effect for the entire course sequence.

If you receive a D or an F in a course you may not repeat it using the P/NP option. If you receive an Incomplete in a course you took for a letter grade, you may not complete the course on a Passed/Not Passed basis.

College of Agricultural and Environmental Sciences: The Passed/Not Passed option should be used only for elective courses, not for courses taken to fulfill major requirements. An NP grade in a course required by the major could prevent graduation. When in doubt, check with your faculty adviser before electing to take a course Passed/Not Passed.

College of Engineering: While registered in the College of Engineering, you may take a maximum of one course per quarter for which you choose the Passed/Not Passed grading option; you must be registered in at least 12 units. Courses that are graded P/NP only may be taken simultaneously with the courses for which you exercise the Passed/Not Passed option.

In the engineering curricula, only courses taken to satisfy (a) the unrestricted electives requirements, or (b) the Humanities–Social Sciences electives (not General Education), or (c) the English and rhetoric requirements, or (d) the technical electives requirement, may be taken on a Passed/Not Passed basis. In addition, certain design courses may be taken on a Passed/Not Passed basis. Consult the Undergraduate Office for information about which design courses may be taken on this basis. All other courses must be taken for a letter grade. Humanities–Social Science courses that you plan to offer in fulfillment of the campus General Education requirement must be taken for a letter grade.

You must meet the following conditions to exercise the Passed/Not Passed option:

- be in good academic standing (not on probation or subject to dismissal)
- carry at least 12 units, including the course to be taken P/NP, in that quarter
- have a P/NP petition approved by the Associate Dean for Undergraduate Studies or a designated representative

College of Letters and Science: Students enrolled in the College of Letters and Science are subject to an additional limitation on the number of units which may be completed employing the Passed/Not Passed option (see the College of Letters and Science entry in the “Bachelor’s Degree Requirements” chapter). Graduating seniors, and other students planning to undertake graduate or professional studies, should consult an adviser before petitioning for Passed/Not Passed in courses required for the major program.

Satisfactory/Unsatisfactory (S/U)

The grade of S is awarded to graduate students for work in graduate courses which otherwise would receive a grade of B– or better, and in undergraduate courses for work which otherwise would receive a grade of C– or better. Graduate students, under certain circumstances, may be assigned grades of S or U, but units earned in this way will not be counted in calculating the grade point average.

Petitions are available from the Graduate Studies Office and must be signed by your graduate adviser. (See also Individual Study courses.) A graduate course in which a C, D, or F grade is received may not be repeated with the S/U option.

In specific approved courses instructors will assign only Satisfactory or Not Satisfactory grades. Such courses count toward the maximum number of units graded S allowable toward the degree.

In-Progress (IP) Grading

For a course extending over more than one quarter (designated “deferred grading only, pending completion of sequence” in course descriptions), evaluation of



student performance is deferred until the end of the final quarter. Provisional grades of IP are assigned in the intervening quarters and are replaced with the final grade at the completion of the sequence. In order to gain credit toward graduation, a student must successfully complete the entire sequence. (See above for electing P/NP grading for a course graded in-progress.)

Incomplete Grades

The grade of I may be assigned when a student’s work is of passing quality and represents a significant portion of the requirements for a final grade, but is incomplete for a good cause as determined by the instructor. (Good cause may include illness, serious personal problems, an accident, a death in the immediate family, a large and necessary increase in working hours, or other situation of equal gravity.)

You may replace an I grade with a passing grade and receive unit credit (and grade points if the instructor assigns a letter grade) provided you satisfactorily complete the coursework as specified by the instructor. In order to change your records, you must obtain a petition from the Office of the Registrar and present it to your instructor for completion and mailing.

An I grade must be replaced with a letter grade (or P or S grade) before the end of the third succeeding quarter (excluding summer sessions) of the student’s academic residence, or the grade will revert to an F (or NP or U). If a student’s degree is conferred before the expiration of the time limit for an I-grade conversion, and the grade is not replaced by the end of the third

quarter succeeding the quarter in which the I grade was assigned, the I grade will remain on the student's record.

You may not re-register for credit in a course for which an I grade has been assigned. An undergraduate student whose record shows more than 16 units of I grades will be subject to disqualification. A graduate student who accumulates more than eight units of I grades will be subject to probation.

Incomplete grades will not be included in your grade-point average at the end of a quarter. At the time of graduation, however, any remaining I grades are included when your grade point average is computed, in order to determine whether you have achieved the 2.0 average required for the bachelor's degree. An Incomplete grade, in these computations, has the same effect as a grade F, NP, or U, depending on which option you have exercised. Therefore, it is recommended that students not delay the clearance of incomplete grades so as not to jeopardize graduation.

Changes of Grade

All grades except I and IP are final when filed by an instructor at the end of the quarter. No final grade except I may be revised by examination or the submission of additional work after the close of the quarter.

If, however, a clerical or procedural error in the reporting of a grade by the instructor can be documented, you may request a change of grade with a petition available from department offices.

Repeating Courses

Undergraduates may repeat any course in which they received a D, F, or NP. Courses in which students received a grade of D or F may not be repeated on a P/NP basis. (Courses in which a grade of NP was received may be repeated on a P/NP basis.)

Degree credit for a repeated course will be given only once, but the grades assigned for both the first and second time a course is taken will appear on the student's transcript. In computing the GPA of undergraduates who have received a grade of D, F, or NP, only the grade and corresponding grade points earned the second time a course is taken will be used, up to a maximum of 16 units for all courses repeated. After the 16-unit maximum is reached, the GPA shall be based on all grades assigned and total units attempted.

Repeating a course more than once requires approval by the appropriate college dean. Departments may restrict the repetition of a course if it is a prerequisite to a course that the student has already completed with a grade of C- or better.

Graduate students, with the consent of the appropriate graduate adviser and the Dean of Graduate Studies, may repeat any course in which they received a C, D, F, or U, up to a maximum of 9 units for all courses repeated. Courses in which a grade of C, D, or F has been earned may not be repeated on a S/U basis. (Courses in which a grade of U was received may be repeated on a S/U basis.)

Degree credit for a repeated course will be given only once, but the grades assigned for both the first and second time a course is taken will appear on the student's transcript. In computing the GPA of graduate students

who have received a grade of C, D, or F, only the most recently earned grade for each course and corresponding grade points will be used, up to the nine-unit maximum. After the nine-unit maximum is reached, the GPA will be based on all grades assigned and total units attempted.

Mid-Term Grade Standing

Students wishing to know their grade at the mid-quarter should ask the instructor. Those who have deficient grades (D, F, or Not Passed) are urged to confer with their advisers.

Final Grades

Grades are generally available about three weeks after a quarter has ended. Students can call *RSVP* to hear their grades at the times and dates announced by the Office of the Registrar. If you wish to have your grades mailed to you, bring in a stamped, self-addressed envelope with your student photo I.D. card to the Office of the Registrar before the end of the quarter.

Transcripts

A record of each student's academic work at UCD is retained permanently by the Office of the Registrar. Copies of your official transcript may be obtained from that office for \$4.00 a copy. Transcripts of all work done through University Extension or Concurrent Enrollment should be requested directly from the University Extension Office, 1333 Research Park Drive. Transcripts of work completed at another campus of the University or at another institution must be requested directly from the campus or institution concerned.

Application for a transcript of record should be made at least two weeks in advance of the time needed.

HONORS AND PRIZES

Deans' Honors Lists

According to Davis campus regulations, the quarterly Dean's Honors List includes names of students who have completed, for a letter grade, a minimum of 12 units in a specific quarter with a grade point average equal to or higher than the minimum grade point average attained by the upper 16 percent of those registered in the same class level and college during that quarter. Honors lists will be posted quarterly on bulletin boards outside deans' offices, and a notation of these honors will be placed on each student's permanent record by the Office of the Registrar.

Scholarships

Students with outstanding academic records who show promise of continued scholarly achievement are encouraged to apply for scholarship recognition and awards. Awards are accompanied by a financial honorarium or stipend. Information about scholarships is available from the Scholarship Office, 207 North Hall, 916-752-2393.

Graduation Honors

Honors at graduation are awarded to students who have a grade point average in the top percent of their college as shown in the table below. (The College of Letters and Science requires that additional criteria be met for high and highest honors—see explanation below.)

Total Quarter Units Completed at UC	Highest Honors	High Honors	Honors	Total
45-89	2%	2%	4%	8%
90-134	3%	3%	6%	12%
135+	4%	4%	8%	16%

Grade point averages from the winter quarter previous to graduation are used to determine the averages that will earn an honors designation. Following are the averages for winter quarter 1994. These averages will be used through winter 1995.

Grade Point Average by College

Percent Determining Cut-Off Point	Agricultural and Environmental Sciences	Engineering	Letters and Science
2%	3.845	3.875	3.845
3%	3.815	3.826	3.818
4%	3.759	3.804	3.782
6%	3.671	3.743	3.701
8%	3.600	3.656	3.646
12%	3.491	3.567	3.550
16%	3.403	3.454	3.468

An honors notation is made on students' diplomas and on their permanent records in the Office of the Registrar.

College of Letters and Science. Graduation with honors requires that a student meet the appropriate grade point requirement for all courses as described in the above table. Students who complete the College Honors Program and who meet the grade point requirement for graduation with honors may be recommended by their departments for graduation with high honors or highest honors on the basis of an evaluation of their academic achievements in the major and in the honors project in particular. Graduating students will not be awarded honors with the bachelor's degree if more than eight units of grade I (Incomplete) appear on their transcripts. The College Committee on Honors may consider exceptions to this condition. Petitions for this purpose should be submitted to the Dean's Office.

The Honors Program of the College of Letters and Science

The Honors Program in the College of Letters and Science is designed to permit students to pursue a program of study in their major at a level significantly beyond that defined by the normal curriculum. It represents an opportunity for the qualified student to experience aspects of the major that are representative of advanced study in the field. Successful completion of the College Honors Program is a necessary prerequisite to consideration for the awarding of high or highest honors at graduation.

Entrance into the honors program requires that a student have completed at least 135 units with a minimum grade point average of 3.5 in courses counted toward the major. Other prerequisites for entrance into the program are defined by the major. The program consists of a project whose specific nature is determined by consultation with the student's major adviser. It may involve completion of a research project, a scholarly paper, a senior thesis, or some comparable assignment depending on the major. The project will have a minimum duration of two quarters and will be noted on the student's record by a variable unit course number or special honors course designation. Successful completion of the honors program requires that a minimum of six units of credit be earned in coursework for the project.

Prizes

The University Medal is the highest campus honor awarded to a graduating senior in recognition of superior scholarship and achievement. In addition, a College or School Medal is given to the outstanding graduating student in each of the colleges and professional schools.

Departmental citations, special awards, and prizes are also awarded to students for superior achievement and scholarship.

College of Agricultural and Environmental Sciences.

Each year the outstanding graduating senior in the College is awarded a silver medal, known as the "Agricultural and Environmental Sciences Medal." Scholastic excellence (in a minimum of six quarters at UC Davis) is the primary basis for choosing the recipient. The Mary Regan Meyer Prize is awarded to an outstanding graduate who has demonstrated expertise and an interest in serving humanity.

College of Engineering. Each year outstanding senior students in engineering are recommended by the faculty of the College as nominees for the College of Engineering Medal. Academic excellence is the primary basis for selecting the recipient of the award.

College of Letters and Science. Graduating seniors with a distinguished academic record may be recommended by the faculty as nominees for the College's Herbert A. Young Medal. Each June, one medalist is selected from among the graduates of the current academic year. The Leon H. Mayhew Award is conferred upon the outstanding graduate from a disciplinary area other than that of the College medalist. Academic excellence is the primary basis for selecting the recipients of these awards.

The Lawrence J. Andrews prize is awarded to a student entering the senior year who not only has achieved academic excellence, but who also has demonstrated interests outside of pure scholarship.

Honorary Societies

Election to an honorary society is one of the most prestigious awards a student can receive. At UC Davis, the following honorary societies are represented:

- Alpha Epsilon (Agricultural Engineering)
- Alpha Kappa Delta (Sociology)
- Alpha Omega Alpha (Medicine)
- Alpha Zeta (College of Agricultural and Environmental Sciences)
- Delta Phi Alpha (German)
- Dobro Slovo (Russian)
- Golden Key (All colleges and schools)
- Kappa Omicron Nu (Applied Behavioral Sciences)
- Omicron Delta Epsilon (Economics)
- Order of Omega (Fraternities-Sororities)
- Order of the Coif (Law)
- Phi Alpha Theta (History)
- Phi Beta Kappa (College of Letters and Science)
- Phi Kappa Phi (All colleges and schools)
- Phi Sigma (Biological Sciences)
- Phi Zeta (Veterinary Medicine)
- Pi Alpha Xi (Environmental Horticulture)
- Pi Delta Phi (French and Italian)
- Pi Mu Epsilon (Mathematics)

Pi Sigma Alpha (Political Science)
 Prynthean Honor Society (All colleges—undergraduate women only)
 Psi Chi (Psychology)
 Sigma Pi Sigma (Physics)
 Sigma Xi (All colleges and schools—research)
 Tau Beta Pi (Engineering)

WITHDRAWALS AND LEAVES OF ABSENCE

Withdrawals may be granted by the University for emergency reasons or for good cause. In order to withdraw, you must first obtain approval from the dean of your college or school. Unauthorized withdrawals will jeopardize registration privileges and result in failing grades. Petitions for Withdrawal are available at the Office of the Registrar. Information on fee refunds can be found in the Fee Refund section of this catalog. The following signatures are required on withdrawal petitions: director of the Student Health Center; adviser, lab or course instructor; Student Aid Accounting Office; Cashier's Office; and the dean of your college, division, or school.

If you are receiving financial aid, you must report your change of status immediately, in person or by mail, to the Financial Aid and Student Aid Accounting Offices. If you are receiving veterans benefits, you must also report your withdrawal to the Veterans Affairs Office.

Retroactive Withdrawals

Petitions for retroactive withdrawals may be obtained from the Office of the Registrar. Reasons for seeking such are medical problems, severe emotional difficulties, or death or severe illness in the immediate family. Petitions should include a detailed account of the problem, appropriate documentation, and an adequate explanation of why withdrawal was not taken during the quarter in which the problem occurred.

Planned Educational Leave Program (PELP)

The Planned Educational Leave Program allows students to suspend academic work, leave the campus, and later resume studies with a minimum of procedural difficulties.

Any registered student on the Davis campus, undergraduate or graduate, is eligible to enroll in the Planned Educational Leave Program. Freshmen and transfers who have been admitted but have not yet registered or attended classes are also eligible, providing an opportunity for beginning students to pause between high school or community college and the University.

To apply for PELP, file an application, including a brief written explanation of the reason for leaving the campus, and stating when you intend to resume academic work. Applications for Planned Educational Leave are available at the Office of the Registrar and should be filed with the Office of the Registrar (Admissions Office for new students) no later than the tenth day of instruction.

A fee of \$40 is charged, payable when you enroll in the program. This fee is identical to that paid by a student who withdraws and is required to pay a readmission fee upon return.

The minimum Planned Educational Leave is one full quarter; the normal maximum leave is one full academic year. You may, however, request an extension of your leave. For purposes of this program, leave of one full quarter is defined as a leave beginning no later than the tenth day of instruction in a quarter. You should be entitled to a partial refund of fees paid. (See Fee Refunds.)

Students enrolled in the program are expected to devote their leave period to non-classroom activities. Students on Planned Educational Leave are not eligible to register in concurrent courses on the Davis campus and may not earn academic credit at Davis during the period of the leave.

Readmission is guaranteed assuming you resume regular academic work at the agreed-upon date and satisfy any holds that may have been placed on your registration. Students who do not return at the agreed-upon date and who do not officially extend their leave will be automatically withdrawn from the University.

You will not be eligible to receive all normal University services during the planned leave. Certain limited services, however, such as placement and student employment services, counseling, and faculty advising are available. Students on Planned Educational Leave may purchase a health care card from the Student Health Service and may retain library privileges by purchasing a library card. International students should consult Services for International Students and Scholars to find out what effects the Planned Educational Leave will have on their status. Grants and other financial aids will be discontinued for the period of the leave, but every effort will be made, where legally possible, to allow you to renegotiate loan payment schedules and to ensure the availability of financial aid upon your return.

PROBATION AND DISMISSAL

The following provisions apply to all undergraduates. Graduate and professional students with scholarship deficiencies are subject to action at the discretion of their respective deans.

A student will be placed on **probation** for failure to meet qualitative or quantitative standards of scholarship. The qualitative standards of scholarship require that a student maintain a C average (2.0) or better for all work undertaken in the University and for the work undertaken in any one quarter.

A student will be placed on **probation for qualitative reasons** if, at the end of any quarter, the student's grade point average (GPA):

- is less than 2.0, but not less than 1.5, for the quarter.
- is less than 2.0 for all courses taken within the University of California.

A student will be subject to **disqualification for qualitative reasons** if, at the end of any quarter,

- the student's grade point average (GPA) is less than 1.5 for the quarter.
- the student has attempted more than 16 units graded I (Incomplete).

- the student has spent two consecutive quarters on academic probation.

In the case of probation or disqualification the official transcript will state "not in good standing." Once a student has met quantitative standards for scholarship, the notation will be removed from the transcript.

The quantitative standards, referred to as **minimum progress requirements**, define scholarship in terms of the number of units that you must satisfactorily complete. Minimum progress is defined as an average of 12 units passed per quarter, calculated at the end of every quarter for the preceding three quarters. Minimum progress requirements do not apply to students who have part-time status or to students who have their dean's approval to carry less than the minimum progress load because of medical disability, employment, a serious personal problem, a death in the immediate family, or an accident.

The notation "warning—minimum progress" will be noted on the grade report for a quarter in which the student has passed less than 12 units. The notation "minimum progress—subject to academic disqualification," will be noted on the grade report the first time the total number of units passed at UCD is **less than 36**, calculated at the end of every quarter for the preceding three quarters of enrollment. Quantitative standards are not reflected on the official transcript.

It is assumed that a student will earn the 180-unit minimum degree requirement prior to completing 15 quarters of enrollment. Normal progress would achieve 180 units in 12 quarters.

The following courses may be counted toward unit minimum progress:

- Required non-credit courses, e.g., Mathematics B, will be evaluated according to the "Carnegie unit" rule and counted as units passed
- Repeated courses passed to improve D or F grades
- Courses passed during Summer Sessions at UCD or at another accredited school and transferred to UCD will be counted as units passed (applied to quarter of registration just preceding the summer session)
- Courses passed by examination in accordance with policies established by the Divisional Committee on Courses (applied to quarter in which examination is taken)
- Courses that are IP (in progress) will be counted as units passed
- Courses graded I will be counted as units passed when replaced by a passing grade (applied to the quarter in which the I grade is received)

The dean of the student's college may grant a student a minimum progress variance of one or more quarters for an acceptable reason. See your faculty adviser or go to the dean's office of your college if you need academic advising about probation and dismissal.

Dismissal

Dismissal for either qualitative or quantitative reasons (defined above) is based on the decision of the dean of the college in which you are enrolled. Such dismissal

is from the University of California system and not simply the college or the Davis campus. Should a former Davis student later wish to be readmitted on the Davis campus, the authority to do so rests with the dean of the college from which the student was dismissed.

Transfer with Scholastic Deficiencies

To transfer from one University campus to another, or from one college or school to another on the same campus, a disqualified or probational student must obtain the approval of the dean whose jurisdiction is being sought. Following the transfer, the student is subject to supervision by the faculty of the new college, school, or campus.

SUMMER SESSIONS

44 Mrak Hall
Davis, California, CA 95616-8715
(916) 752-1641 or 1-800-VIP-2738;
e-mail: summer-sessions@ucdavis.edu

Every summer, several thousand students (more than 6,800 in 1993) turn to the Office of Summer Sessions at the University of California, Davis for an opportunity to complete their undergraduate degrees, earn units, expand their knowledge, do research, take special study courses, meet prerequisites, or take courses that are often over-enrolled during the academic year.

Summer Sessions offers a wide range of lower and upper division courses (250 in 1993) that provide full University credit transferable to most campuses. Admission is open to virtually all mature adults, so Summer Sessions attracts students from a wide range of universities and colleges, high school graduates and juniors, and many other qualified applicants. Admission to a summer session, however, does not guarantee or imply admission to the University's regular academic quarters.

In 1995, the Office of Summer Sessions will offer two six-week sessions: June 19 to July 28 and July 31 to September 8. All UC Davis undergraduates will automatically receive our 1995 Summer Sessions Catalog and application materials by the end of April; non-UCD undergraduates should contact us at the address above, at (916) 752-1641, or through e-mail at summer-sessions@ucdavis.edu.

Special programs (including intensive language programs and the Summer Humanities Institute: An Honors Program for High School Juniors) as well as international programs will be offered in 1995. Last year, UC-registered students had the opportunity to study in England, Italy, Japan and Scotland. For more information on international programs, call (916) 752-0435; for more information on the Summer Humanities Institute, call (916) 752-7649.

BACHELOR'S DEGREE

REQUIREMENTS



You must satisfy four groups of requirements before you can become eligible for candidacy for the bachelor's degree. The four groups are as follows:

1. University requirements, which apply to all colleges;
2. General Education requirement, which applies to all colleges;
3. College requirements; and
4. Major requirements.

Detailed information on University requirements, the General Education requirement, and college requirements can be found in this chapter.

Every student is responsible for seeing that all degree requirements are fulfilled.

Bachelor's Degree Requirements

University Requirements

All students must fulfill the following University of California requirements:

- Subject A
- American History and Institutions Unit Requirement
- Residence Requirement
- Scholarship Requirement

General Education Requirement

Students are required to complete a certain number of courses in the two areas of General Education other than the one that contains their major field.

College Requirements

- College of Agricultural and Environmental Sciences
 - Unit
 - Residence
 - Scholarship
 - English Composition
- College of Engineering
 - Unit
 - Residence
 - Scholarship
 - English Composition
 - Design
- College of Letters and Science
 - Unit
 - Residence
 - Scholarship
 - English Composition
 - Area (Breadth)
 - Foreign Language (A.B. and B.A.S. degrees)

Major Requirements

Course requirements for each major are listed in the Programs and Courses section of this catalog.

UNIVERSITY REQUIREMENTS

Subject A: English Requirement

The University requires every undergraduate student to demonstrate college-level proficiency in English composition. Satisfaction of the Subject A requirement is a prerequisite to all other undergraduate courses in English.

The requirement, as determined by Undergraduate Admissions, may be met in one of the following ways:

- By achieving a score of 600 or higher on the College Board Achievement Test in English Composition.
- By achieving a grade of 5, 4, or 3 in the College Board Advanced Placement Examination in English.
- By entering the University with credentials showing the completion of an acceptable 3 semester-unit or 4 quarter-unit college-level course in English composition with a grade of C or better.
- By passing *with credit* the California State University and Colleges English Equivalency Examination. (Note: the CSUC English Placement Test *may not* be used to satisfy the Subject A requirement.)
- By writing a passing essay on the Subject A Examination. This examination may be taken only once. It is offered in the spring at local sites throughout California; a student admitted for fall quarter who has not already satisfied the Subject A requirement *must* take this examination. An out-of-state student or any California freshman admitted after mid-April will take another form of the Subject A Examination, which will be offered on the UCD campus during the orientation period each quarter. For the time and location consult the *Fee Payment, Registration, and Orientation Information* bulletin, published before the beginning of each quarter.

If you have not satisfied the requirement in one of the ways described above, *you must register in English 57 during your first quarter of residence at the University, or as soon thereafter as space is available in the course.* English 57, offered by Sacramento City College on the Davis campus, counts as 4.5 units on your study list and toward minimum progress but is not transferable as units towards graduation. To satisfy the requirement, students must pass the Subject A Examination offered as the final examination for English 57. Students failing the examination must repeat English 57. If the requirement has not been satisfied by the end of your third quarter of registration, a hold will be placed on your registration.

Students whose native and school language is not English, and some students whose schooling combines work in the United States and in another country, must demonstrate proficiency in English. The level of proficiency must meet the standards of both the non-native speakers of English program and the Subject A program. The results of the Subject A Examination *and* a special examination in English administered during the orientation period each quarter determine whether a student has met the Subject A requirement or must take specific coursework before meeting that requirement.

American History and Institutions

The American History and Institutions requirement ensures that every graduating student will have at least a minimum knowledge of the background of this country's

development and an understanding of the political, economic, and social interrelationships of its way of life.

You may meet this requirement in any of the following ways:

- By offering one high school unit in American history, or ½ high school unit in American history and ½ high school unit in civics or American government, with a grade of C or better in each course.

- By completing any one of the following courses:

African American Studies 10, 100, 120, 121

Asian American Studies 1, 2

Economics 111A, 111B

History 17A, 17B, 17C, 72A, 72B, 170A, 170B, 170C, 171A, 171B, 174A, 174B, 174C, 175A, 175B, 175C, 176A, 176B, 177A, 177B, 179, 180A, 180B, 183A, 183B (upper division courses may be taken only with the consent of the instructor)

Native American Studies 1, 10, 55, 116, 130A, 130B, 130C

Political Science 1, 5, 100, 101, 102, 103, 104, 105, 106, 108, 109, 113, 130, 131, 160, 163

(Students electing to offer one of the above courses are subject to the rules that apply for prerequisites and majors.)

- By presenting evidence that the requirement has been accepted as satisfied at another campus of the University.
- By presenting evidence that the requirement has been satisfied through courses in the area of American History and Institutions at another collegiate institution whose credits are acceptable for transfer to the Davis campus.
- By successful completion of the Advanced Placement Examination in American History.

International students, regardless of the type of visa they hold, must meet the University's American History and Institutions requirement for graduation.

Unit Requirement

A minimum of 180 quarter units is required for graduation. These must be distributed according to the minimum requirements set forth by the faculty of your college.

A maximum of 12 units of *Internship Courses* (92, 192, or a combination) may be counted toward the 180-unit bachelor's degree requirement.

The acceptability of transfer courses for unit credit is determined by the Office of Admissions. The acceptability of such courses toward specific requirements is determined by the individual college or school.

Students should refer to the Advanced Placement Examination chart and their transcripts to eliminate the possibility of duplication of credit.

Residence Requirements

The minimum residence requirement for a bachelor's degree at the University of California is one academic year (three quarters). Each summer session in which a student completes a course of at least 2 quarter units may be counted as half a quarter's residence. Thirty-five of the final 45 quarter units completed by each can-

didate must be earned while in residence on the Davis campus. Not more than 18 of these 35 quarter units may be completed in summer session courses at UCD.

Regularly approved courses (laboratory, field, or other individual work) done outside of a regular session but under the direction of a department of instruction may be accepted upon the recommendation of the department in partial fulfillment of the residence requirement for the bachelor's degree. Registration is with the consent of the instructor only.

University Extension courses are not accepted as part of the University residence requirement.

There are additional residence requirements for students enrolled in the Colleges of Letters and Science and Engineering. If you are planning to study abroad during your senior year, you should consult your college dean's office.

With the approval of the dean of a student's college or school, a candidate for the bachelor's degree who was in active service in the armed forces of the United States in the year preceding the awarding of the degree may be recommended for the degree after only one quarter of University residence in which the candidate completes at least 16 units or passes a comprehensive examination in the major or field of concentration.

Scholarship Requirement

To receive a bachelor's degree, you must obtain twice as many grade points as units (a 2.0 GPA) for all courses you have attempted in the University. An exception to this rule is made for those students undertaking certain honors courses. Grades earned in University Extension courses are not used in calculating individual grade point averages. For specific college requirements consult the college sections following.

Filing for Graduation

Each candidate for an undergraduate degree must file an Announcement of Candidacy with the Office of the Registrar for the quarter in which the candidate plans to receive the degree. The dates for filing are published in the Academic Calendar at the front of this catalog.

College of Agricultural and Environmental Sciences. A Major Certification form must be received and evaluated by the Dean's Office before your candidacy for a degree can be finalized. A Major Certification is completed during the quarter a student plans to graduate. At that time, the adviser and student check to see that all *major* requirements have been completed. The Dean's Office completes the degree certification by verifying that all *College* and *University* requirements have been satisfied.

GENERAL EDUCATION REQUIREMENT

The General Education Program promotes the intellectual growth of all undergraduates. The program's objectives are: (1) to offer a choice of courses in all major fields of learning; (2) to stimulate intellectual growth through the study of important methods as well as significant material in a particular discipline; (3) to involve students in the learning process by requiring considerable writing and participation in class activi-

ties; and (4) to encourage students to apply the concepts and methods of a discipline in appropriate advanced-level courses.

In designing the UC Davis General Education Program, the faculty specified that General Education courses should help students acquire skills that will serve them well beyond their undergraduate years. General Education (GE) courses are designed to encourage development of analytical reasoning and clear communication skills through active participation in the classroom. GE courses stress understanding of intellectual concepts and methods, connect their subject with other fields of knowledge, and discuss the social, ethical and aesthetic issues raised by their inquiry. In order to break away from traditional ways of categorizing the broad fields of inquiry and in order to encourage interdisciplinary connections, GE courses are grouped into three broad areas of knowledge:

1. **Civilization and Culture.** Courses in this area present dominant intellectual traditions, achievements, and socio-political institutions, and increase awareness of cultural diversity within the Western tradition and in other civilizations.
2. **Contemporary Societies.** Courses in this area create an awareness of critical economic, political, and social problems of the contemporary world.
3. **Nature and Environment.** Courses in this area provide students with knowledge of major scientific ideas and discoveries and some perception of the methods, scope, power, limitations, and appeal of science.

GE courses may be either lower division or upper division. Courses numbered 0-99 are lower division and courses numbered 100-199 are upper division. You should consult the course descriptions contained in the Programs and Courses section of this catalog for the courses designated as prerequisite for upper division courses.

Determining Your General Education Requirement

You must complete three courses in each of the two General Education areas outside of the area of your major. Two of the three courses in each area must be certified General Education courses. One of the three courses in each area must be an upper division course.

Each academic major, minor, and degree program has been assigned to one of the three areas of General Education. Each GE course has also been assigned to one of the three areas. You must complete courses in those areas of General Education other than the one that contains your major field.

A **minor** in an area outside the area of your major will satisfy your GE requirement in that minor's area. **Double majors** will satisfy the GE requirement in two areas only if the majors are assigned to two different areas. You will still be responsible for completing the GE requirement in the third area. Double majors in the same area do not reduce your GE requirements.

If you have an approved **individual major**, it should have been assigned to one of the three General Education areas at the time it was approved by your college. If you have any questions concerning the GE area to which your major was assigned, consult your college

dean's office. The specific General Education requirements for students entering UCD from the 1984-85 academic year and thereafter are detailed in the General Education Requirements table on the following page.

Transfer Credit. If you have transferred from a community college or other post-secondary institution, or enter with Advanced Placement (AP) units, you still have to complete some GE courses at UC Davis, but the number of required courses may be reduced depending upon the number of transfer or AP units you have brought with you.

The following courses and transfer credits will be used in determining the General Education requirement for transfer students:

- UCD Extension courses if they are accepted for transfer by the Office of Undergraduate Admissions.
- Advanced Placement credit.
- Transfer work from other community colleges and four-year institutions.

UCD Summer Sessions courses completed before entry do not count as "transfer credit" for determining your GE requirement. Successful completion of an approved GE course during a UCD Summer Session before entry, however, will count toward satisfaction of the GE requirement.

Consult the "Transfer Credit Evaluation" form prepared by the Office of Undergraduate Admissions to determine your transfer credits.

You are exempt from the UCD General Education Requirement if

- you come from a California community college or other institution of higher education and have completed the "Transfer Core Curriculum;"
- OR**
- you come from another campus of the University of California and have completed the lower division breadth or General Education requirements of that campus.

Your college dean's office can tell you whether you fall into either of these categories.

Fulfilling Your General Education Requirement

In addition to the requirements outlined above and in the GE requirements table, you must meet the following conditions:

1. **Letter grading.** All courses taken to fulfill the GE requirement must be taken for a letter grade. No GE credit will be awarded for a course that is taken on a Passed/Not Passed basis.
2. **Subject A.** This requirement must be completed before you begin your GE coursework. Exception: GE credit may be earned before completing the Subject A requirement for the following course sequences which have been approved for the General Education Program: Chemistry 2A-2B, Economics 1A-1B, Psychology 15-16, and Music 3A-3B.

If you completed a GE course before fall 1986 on a Passed/Not Passed basis or before having completed Subject A, you will receive GE credit for that course.

Approved General Education Clusters

General Education "clusters" are groups of closely related introductory GE courses. There are two approved clusters in the area of Civilization and Culture: History 4A, 4B, 4C; and Comparative Literature 1, 2, 3. There is one approved cluster in the area of Nature and Environment: Animal Science 1, 2, 42.

You may earn credit for having satisfied the entire requirement in an area of General Education by com-

pleting an approved cluster. A cluster allows you to substitute lower division for any required upper division courses.

Selecting General Education Courses

Since GE courses must be chosen from the two areas of General Education other than the one containing your major field, you must begin by identifying the area of General Education to which your major has been assigned. The following list provides this information.

GENERAL EDUCATION REQUIREMENTS			
(GE courses must be completed in the areas of General Education other than the area containing the major.)			
Academic Year of Entrance to UCD	Student Status		
	Freshman or transfer student with 40 or fewer transfer units¹	Transfer student with more than 40 but fewer than 84 units²	Transfer student with 84 or more units
1984-85	2 GE courses: <ul style="list-style-type: none"> • may be in same or different areas; • may be introductory or non-introductory 	No GE requirement	No GE requirement
1985-86	4 GE courses: <ul style="list-style-type: none"> • maximum of 3 in one area; • maximum of 2 introductory 	2 GE courses: <ul style="list-style-type: none"> • may be in the same or different areas; • may be introductory or non-introductory 	No GE requirement
1986-87	6 GE courses: <ul style="list-style-type: none"> • 3 courses in each of two areas; • must have 1 introductory and 2 non-introductory courses in each area 	4 GE courses: <p><i>Option 1:</i> 2 courses in each of two areas:</p> <ul style="list-style-type: none"> • only 1 course in each area may be introductory <p><i>Option 2:</i> 3 courses in one area and 1 in the other:</p> <ul style="list-style-type: none"> • must have 1 introductory and 2 non-introductory in the area with 3 courses; • the single course in the other area may be introductory or non-introductory 	2 GE courses: <ul style="list-style-type: none"> • may be in the same or different areas; • may be introductory or non-introductory
1987-88 to 1991-92	Same as for 1986-87	Same as for 1986-87	2 or 3 GE courses: <p><i>Option 1:</i> 1 course in each of two areas:</p> <ul style="list-style-type: none"> • both courses must be non-introductory <p><i>Option 2:</i> 3 courses in one area:</p> <ul style="list-style-type: none"> • must have 1 introductory and 2 non-introductory courses
1992-93, and thereafter	6 GE courses: <ul style="list-style-type: none"> • 3 courses in each of two areas; • at least 1 upper division course in each area; • at least 2 of the 3 courses in each area <i>must</i> come from the list of certified GE courses; • the third course in each area may come from a list of courses approved for GE credit by your college. 	4 GE courses: <p><i>Option 1:</i> 2 courses in each of two areas:</p> <ul style="list-style-type: none"> • at least 1 course in each area must be upper division; • at least 1 course in each area <i>must</i> come from the list of certified GE courses; • the second course in each area may come from a list of courses approved for GE credit by your college. <p><i>Option 2:</i> 3 courses in one area;</p> <ul style="list-style-type: none"> • at least 1 course must be upper division; • 2 courses must come from the list of certified GE courses; • the remaining course may come from a list of courses approved for GE credit by your college; <p>and</p> <ul style="list-style-type: none"> • 1 upper division course in the other area, which must come from the list of certified GE courses. 	2 or 3 GE courses: <p><i>Option 1:</i> 1 upper division course in each of two areas;</p> <ul style="list-style-type: none"> • both courses <i>must</i> come from the list of certified GE courses. <p><i>Option 2:</i> 3 courses in one area;</p> <ul style="list-style-type: none"> • at least 1 course must be upper division; • 2 courses <i>must</i> come from the list of certified GE courses; • the remaining course may come from a list of courses approved for GE credit by your college

¹ For the academic years 1984-85 through 1986-87, this category of GE requirements applied to freshmen or transfer students with **fewer than 41 units**; the unit cut-off was changed fall 1987.

² For the academic years 1984-85 through 1986-87, this category of GE requirements applied to transfer students with **41 or more but fewer than 84 units**; the unit cut-off was changed fall 1987.

Civilization and Culture (CC)

American Studies	History
Art History	Italian
Art Studio	Landscape Architecture
Chicana/Chicano Studies (Humanities emphasis)	Latin
Classical Civilization	Linguistics
Comparative Literature	Medieval Studies
Design	Music
Dramatic Art	Philosophy
East Asian Studies	Religious Studies
English	Rhetoric and Communication
French	Russian
German	Spanish
Greek	

Contemporary Societies (CS)

African American and African (Afro-American) Studies
 Agricultural and Managerial Economics
 Anthropology (A.B. degree)
 Applied Behavioral Sciences
 Asian American Studies (non-degree program)
 Chicana/Chicano Studies (Sociology emphasis)
 Economics
 Environmental Policy Analysis and Planning
 Geography (A.B. degree—emphasis I, II, III, V)
 Human Development
 International Agricultural Development
 International Relations
 Native American Studies
 Political Science
 Political Science—Public Service
 Sociology
 Sociology—Organizational Studies
 Textiles and Clothing
 Women's Studies

Nature and Environment (NE)

Agricultural Systems and Environment
 Animal Science
 Animal Science and Management
 Anthropology (B.S. degree)

Applied Science
 Atmospheric Science
 Avian Sciences
 Biochemistry
 Biological Sciences
 Chemistry
 Community Nutrition
 Computer Science
 Dietetics
 Engineering (all majors)
 Entomology
 Environmental and Resource Sciences
 Environmental Biology and Management
 Environmental Toxicology
 Fermentation Science
 Fiber and Polymer Science
 Food Biochemistry
 Food Science
 Genetics
 Geography (B.S. degree; A.B. degree—emphasis IV)
 Geology
 Mathematics
 Microbiology
 Nutrition Science
 Physical Education
 Physics
 Physiology
 Plant Biology (Botany)
 Plant Science
 Psychology
 Soil and Water Science
 Statistics
 Wildlife and Fisheries Biology
 Zoology

Approved General Education Courses

A list of the courses and course sequences that have been approved for offering under the General Education Program appears on the following page. This listing is subject to change. You should check the *Class Schedule and Room Directory* each quarter for the most current information.



GENERAL EDUCATION COURSES FOR 1994-95

Note: This list contains approved GE courses for the current academic year only. Please consult prior years' catalogs or the Deans' offices for the lists of courses approved in previous years. Please note that you cannot claim GE credit for a course you completed **before** it was an approved GE course.

Civilization and Culture

Lower Division

American Studies 1B, 1E
Art History 1A/1AG¹, 1B/1BG¹, 1C/1CG¹,
1D/1DG¹, 25/25G¹
Chinese 11
Classics 4A, 15, 17A, 17B, 17C, 20, 50
Comparative Literature 1, 2, 3, 4, 5, 6, 7, 8, 9,
12, 13, 14, 20, 25, 53B
English 3, 4, 30A, 30B
French 25
German 48, 50, 52A, 52B, 52C
History 3, 4A, 4B, 4C, 8, 9A, 17A, 17B, 30,
72A, 72B
History & Philosophy of Science 20
Integrated Studies 2B⁴, 2D⁴, 3B⁴, 3C⁴, 8B⁴
Italian 50
Landscape Architecture 40
Linguistics 1, 50
Medieval Studies 20A, 20B, 20C
Music 3A-3B², 10
Philosophy 1, 11, 13, 14, 21, 22, 23, 24, 31
Political Science 4
Religious Studies 3A, 3B, 3C, 21, 23, 40
Russian 44
Viticulture and Enology 3

Civilization and Culture

Upper Division

Art History 178C
Chinese 110
Classics 140, 141, 143, 150
Comparative Literature 120, 135, 138, 141,
144, 152, 153, 157, 159C, 160A, 160B,
161A, 161B, 163, 164A, 164B, 164D, 166A,
166B, 168A, 168B, 169, 170
Dramatic Art 156, 157
Education 120
English 118, 156, 162, 171A, 171B, 182, 184
French 112, 113, 114
German 110, 111A, 111E, 112A, 112B, 113,
114, 115A, 116, 117A, 117B, 117C, 118A,
118B, 118C, 118E, 119, 130, 140, 141
History 138, 139A, 140, 147A, 147B, 147C,
161A, 169A, 169B, 175A, 177A, 177B,
188A¹
History and Philosophy of Science 130A,
130B
Humanities 110A
Italian 140, 141, 142
Landscape Architecture 140
Medieval Studies 120A, 120D, 120E
Music 105, 110A, 110B, 110C, 110D, 110E,
129
Native American Studies 130A, 130B, 156,
181A, 181B, 181C
Philosophy 101, 102, 104, 105, 107, 108, 151
Religious Studies 141A, 141B, 141C, 142
Rhetoric and Communication 110
Russian 130, 131, 151, 166
Spanish 149
Veterinary Medicine 170

Contemporary Societies

Lower Division

Agricultural Economics 15
American Studies 1A
Anthropology 2, 4
Applied Behavioral Sciences 2
Chicano Studies 40
Economics 1A-1B²
Environmental and Resource Sciences
10-10G¹
Environmental Studies 10
Geography 2-2G¹, 5-5G¹
History 10, 72B
Human Development 15
Integrated Studies 3A⁴, 3D⁴, 3E⁴, 8C⁴
International Agricultural Development 10
Native American Studies 10, 55
Political Science 1, 2
Psychology 15-16²
Religious Studies 1, 2
Sociology 2, 3, 4, 25
Women's Studies 50

Contemporary Societies

Upper Division

African American and African Studies 100,
133
Agricultural Economics 120, 141, 141M
American Studies 120, 130
Anthropology 101, 117, 124, 129, 130, 133,
178
Applied Behavioral Sciences 151, 153, 154,
178
Chicano Studies 132
Consumer Science 100
Education 110, 122, 132
Engineering 160
Engineering: Applied Science 137
Engineering: Civil and Environmental 160
Environmental Studies 101, 133, 161, 166
Geography 124, 155, 170, 171
History 165, 188B
Linguistics 113
Native American Studies 115, 130C, 180
Philosophy 109, 118
Physics 137, 160
Psychology 175, 177
Russian 132
Textiles and Clothing 107
Veterinary Medicine 170

Nature and Environment

Lower Division

Agricultural Systems and Environment 1-1G¹
Animal Science 1, 2, 42
Anthropology 1, 15, 23
Astronomy 10
Avian Sciences 11, 13
Biological Sciences 10
Chemistry 2A-2B², 10
Engineering 20
Engineering: Civil and Environmental 30
Engineering: Computer Science 15
Entomology 17
Environmental and Resource Sciences 2,
3-3G¹
Environmental Studies 30-30G¹
Food Science and Technology 2
Geology 1-1G¹, 3-3G¹, 43
Human Development 19
Integrated Studies 1A⁴, 1B⁴, 8A⁴
Microbiology 20
Molecular and Cellular Biology 10
Nutrition 10-11³, 20
Philosophy 31
Physics 10
Plant Biology 10
Plant Science 10
Pomology 10
Soil Science 10
Statistics 10
Viticulture and Enology 3
Wildlife and Fisheries Biology 10

Nature and Environment

Upper Division

Agricultural Systems and Environment 121
Anthropology 152, 153
Atmospheric Science 100
Engineering 160
Engineering: Applied Science 137
Engineering: Computer Science 167
Entomology 111, 119, 147, 153
Environmental and Resource Sciences 121,
131
Environmental Studies 116-116G¹
Evolution and Ecology 121, 138
Fiber and Polymer Science 110
Geology 113-113G¹, 116-116G¹, 131, 135,
144
History and Philosophy of Science 130A,
130B
Hydrologic Science 100
Landscape Architecture 155
Philosophy 108
Physics 137, 160
Plant Pathology 140
Plant Science 104

¹These GE courses must be taken concurrently for General Education credit and will satisfy the requirement for one GE course.

²This is a two-course sequence of non-GE courses which will satisfy the requirement for one GE course.

³Nutrition 10 and 11 must both be completed to satisfy the requirement for one GE course. These courses may be taken concurrently, if offered, or sequentially (10 then 11).

⁴GE courses in Integrated Studies are open only to students in the Integrated Studies program.

COLLEGE REQUIREMENTS

College of Agricultural and Environmental Sciences

Unit Requirements

Of the required 180 units counted toward a degree, 54 UNITS MUST BE UPPER DIVISION WORK. In addition, the following unit limitations apply to all majors:

- Not more than 6 units can be Physical Education 1 and 6
- Not more than 20 units can be courses numbered 92, 99, 190C, 192, 197T, 197TC, or 199
- Not more than 12 units can be courses numbered 92 and/or 192 (credit will not be given for 192s taken before the completion of 84 units)
- Not more than 9 units of professional courses (numbers 300-499) may be used toward the 54 upper division units

Credit in University Extension Courses. Students in residence may apply a maximum of 9 units of credit earned in some University Extension courses toward the 180-unit requirement *provided* written approval has been obtained from the dean *before* registering. Units of credit allowed by the dean may be less than the number of units listed for a course. No grade points are assigned for courses completed through University Extension.

Scholarship Requirement

Students in the College are required to attain a minimum grade point average of 2.0 for all courses specified as depth subject matter in their major. Each candidate must complete a program of study either as prescribed in (a) a major approved by the Committee on Majors and Courses and printed in this catalog, or (b) an individual major approved by the Individual Major Committee.

Residence Requirement

Thirty-five of the final 45 quarter units completed by each candidate must be earned while in residence on the Davis campus. Not more than 28 of these 35 quarter units may be completed in summer session courses at UC Davis.

English Composition Requirement

The English Composition requirement can be met in one of two ways:

1. by passing the English Composition Examination administered by the College of Letters and Science upon completion of 70 units of degree credit (the examination does not yield credit);

OR

2. by taking, before you have completed 120 units, **either** two courses emphasizing written expression **or** one course emphasizing written expression and one course emphasizing oral expression. The following UCD courses have been approved for satisfaction of this requirement:

(a) one course must be selected from English 1, 3, 20, or 103 (courses with primary emphasis in writing skills);

(b) one course selected from the courses not selected above, or from English 102, 104, Comparative Literature 1, 2, 3, or Rhetoric and Communication 1 (courses emphasizing either writing or speaking skills).

General Education

You should consult your Dean's Office or department adviser in advance to determine exactly how your General Education courses will apply toward your major.

Degree Requirement Changes

On occasion, the faculty make changes in the requirements that students must satisfy to obtain the baccalaureate degree. So that you will not be penalized by changes that may work to your disadvantage and so that you will benefit by changes that assist you in completing your degree requirements, it is College policy that you may choose to fulfill the University, College, and major requirements in effect at the time you were registered at UC Davis. If you have transferred to UCD from a community college, state college, or university, you may follow the requirements as stated in any UCD catalog in effect *either* during the three years immediately preceding your transfer to Davis or at the time you first registered at that institution, *whichever is most recent*. Once you have chosen the year of the *General Catalog* under which you wish to be governed, you must satisfy all of the University, College, and major requirements specified in that catalog.

Study Plan Approval

A Study Plan provides for attainment of specific long-term goals and should allow for (a) the acquisition of prerequisite knowledge for courses to be taken in subsequent quarters, (b) the fulfillment of College and major requirements, (c) a proper balance between the demands of the courses and your ability to master the subject matter, and (d) meeting the minimum progress regulation (see the Academic Information section).

In conjunction with a faculty adviser and/or staff adviser, you must plan and prepare a program that specifies your goals and shows how the graduation requirements will be met. It is a regulation that a written "study plan" be filed with your faculty adviser or staff adviser by the end of the second quarter of the junior year (having completed not more than 120 units either in residence and/or by transfer).

You will be denied registration for future quarters if you do not comply with this regulation. However, filing this study plan does not preclude a change of major or program modifications.

Major Degree Certification

A Major Certification is completed during the quarter you plan to graduate. At that time, you and your faculty adviser and/or staff adviser check to see that all *major* requirements have been completed. The Dean's Office completes the degree certification by verifying that all *College* and *University* requirements have been satisfied.

College of Engineering

Unit Requirements

Each candidate for the degree of Bachelor of Science in Engineering must satisfactorily complete an approved curriculum in engineering. Each curriculum consists of a specified Lower Division Program (or an approved equivalent program for students who transfer into the College with 84 or more quarter units) and a specified Upper Division Program. Detailed requirements for the approved curricula are given in the Programs and Courses section of this catalog.

If you are admitted with *84 or more quarter units*, you are classified as having upper division standing, but you are required to complete the minimum number of quarter units in the subject areas specified below before your Lower Division Program is considered complete. You may, however, start your Upper Division Program while completing your Lower Division Program requirements.

Subject Areas	Minimum Quarter Units
Mathematics (calculus, differential equations, linear algebra, vector analysis)	22
Physical and biological sciences (typically, at least 10 units must be in general chemistry and at least 12 units in physics courses designed for engineering and physical science students).....	22-26
Engineering (lower division subjects such as graphics, properties of materials, surveying, computer programming, dynamics, statics, and circuit theory. These courses must include statics, dynamics, circuits and FORTRAN for all but Electrical and Computer Engineering and Computer Science majors, who must take Pascal. Students majoring in Mechanical, Aeronautical, Materials Science, Civil, Electrical or Computer Engineering, or Computer Science may have additional course requirements specific to their respective majors. Because of additional lower division chemistry requirements, Chemical Engineering majors may elect to take only 10 units of engineering in their lower division programs).....	15-26

Written and oral expression English 1 or 3, and Rhetoric and Communication 1 or 3, or courses that are their equivalents.....8

Humanities-Social Sciences (courses must be selected from a list of course groups approved by the Committee on Undergraduate Study)5-12

Unspecified subjects (Chemical Engineering majors should cover quantitative analysis and one course in organic chemistry with laboratory during their sophomore year).....7-8

Total.....**84**

Once you have completed the Lower Division Program and fulfilled these specified subject area requirements, you need not take additional lower division courses, except those that are prerequisite to upper division courses in your curriculum.

The minimum number of required units in the combined Lower and Upper Division Programs varies, with the curriculum, from 180 to 195.

You may, for good cause, request a modification of particular degree requirements by submitting a student petition. These petitions, which are available in the Undergraduate Office, can be a valuable aid in resolving individual program conflicts or other special problems. Such petitions are subject to approval by the Undergraduate Study Committee, a body of six professors and six (non-voting) students. A negative decision by the committee may be appealed to the College faculty for action at a regular meeting.

Credit in University Extension Courses. Appropriate courses taken through University Extension may be used for degree credit. Simultaneous registration in resident courses and Extension courses requires *prior approval* by the College's Associate Dean for Undergraduate Studies. Such approval will be given only for a limited number of credits. No grade points are assigned for courses completed in University Extension.

Residence Requirement

In addition to fulfilling the University residence requirement, you must complete at least 35 of the final 45 units



characteristic of your curriculum in engineering while registered in the College.

Scholarship Requirement

In addition to meeting the University scholarship requirement, you are required to maintain a 2.0 grade point average for all engineering coursework.

English Composition Requirement (Upper Division)

After completing 70 quarter units, you may elect to satisfy the upper division English Composition requirement by passing the English Composition Examination administered by the College of Letters and Science. (You should take it early in your junior year and must take it before your last quarter. Units of credit are not given for passing this examination.)

OR,

upon completion of 84 quarter units, you may satisfy this requirement by

1. completing an English 102 adjunct to an approved upper division course in the College of Engineering with a grade of C- or higher; or
2. completing 3 units of English 104 with a grade of P (Passed).

This requirement is in addition to the expository writing course requirement (English 1 or 3, or Comparative Literature 1, 2, 3, or 4) specified in the Lower Division Programs.

During the 1994-95 academic year, the English Composition Examination will be offered on the following three Saturdays: October 29, 1994, January 28, 1995 and April 29, 1995. Sign-up rosters will be posted on the College of Letters and Science Advising Office's bulletin board, Social Sciences and Humanities Building, Monday through Thursday (or until they are filled) just preceding each Saturday examination date. You must sign up, in person, by Thursday. You must obtain the English Composition Examination form, available at the UCD Bookstore, to take the exam.

Engineering Design Requirement

Engineering design is the process of devising a system, component, or process to meet certain needs. Design involves a decision-making process (often iterative), in which the basic sciences, mathematics, and engineering sciences are applied to convert resources optimally to meet a stated objective. Among the fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing and evaluation. You must take at least 24 quarter units of such design coursework through a combination of required and restricted elective courses. Specific comments about design are included in individual curricula descriptions. *You should also review the design content of your individual program with your adviser in the course of completing the upper division advising worksheet.*

Electives

There are four kinds of elective courses in the engineering curricula: *Humanities-Social Sciences*, *General Education*, *technical*, and *unrestricted*. Transfer students have an additional set of electives: *Physical*

and Biological Sciences electives or *Mathematics/Science electives*.

Humanities-Social Sciences electives: Because engineers are significant agents of social change, they must be sensitive to the human setting in which that change takes place. The Humanities-Social Sciences (HSS) electives have been selected within the engineering curricula to increase your awareness of the human and societal implications of engineering practice. The humanities include subject areas such as literature, philosophy, history, and the fine arts. The social sciences include areas such as anthropology, political science, sociology, psychology, and economics.

You must take at least 24 quarter units of coursework in the humanities and social sciences. Subjects that are vocationally oriented or skills oriented, such as management and accounting, or that contain a preponderance of scientific or mathematical content, are not suitable for HSS credit even though a course may be offered by a department ordinarily classified as a humanities or social science department. Foreign language courses must stress literature, not skills, and fine arts courses must emphasize the history and appreciation of forms of expression, not development of performance or other technical skills. You may petition to have a non-literature course in a foreign language which is not your native language count as a humanities course. You may petition for HSS credit for 92, 98, 99, 192, 197, 198, and 199 courses in appropriate cases. If you repeat any of the courses which may be repeated for credit, not more than 4 units in any such courses can be counted toward your HSS requirement.

Your HSS electives should be designed to include a comprehensive and coherent set of courses and may, in some cases, be integrated with your General Education electives, as described in the next section. HSS electives must be selected from the following list.

- African American and African Studies 10, 15, 50, 51, 52, 80, 100, 101, 107, 110, 120, 121, 123, 133, 145A, 145B, 150A, 150B, 151, 152, 153, 160, 162
- Agricultural Economics 1, 100A, 100B, 120, 141, 141M, 148, 150, 175, 176
- American Studies 1A, 1B, 1C, 1E, 1F, 2, 101A-H, 110, 120, 125, 130, 151, 152, 153, 154, 155
- Anthropology 2, 3, 4, 20, 23, 101, 110, 112, 113, 117 through 149B, 170 through 179
- Applied Behavioral Sciences 1, 2, 17, 18, 118, 140, 151 through 154, 157, 161 through 164, 170, 171, 172, 174 through 178, 190
- Art History 1A, 1B, 1C, 1D, 10H, 10S, 15, 25, 150 through 188C, 190 (also Art History 1AG, 1BG, 1CG, 1DG, and 25G when taken concurrently with Art History 1A, 1B, 1C, 1D, and 25)
- Asian American Studies 1, 2, 20, 100, 101, 110, 111, 112, 130, 136, 150, 155
- Chicana/Chicano Studies 10, 30, 40, 50, 60, 70, 100 through 140
- Chinese 10, 11, 104 through 109A-I, 110, 111 through 116, 130, 131, 132, 140, 160
- Classics 4A, 10, 15, 17A, 17B, 17C, 20, 50, 140, 141, 142, 143, 150, 174, 175
- Comparative Literature 1 through 53B, 120, 135 through 180
- Consumer Science 100
- Design 140, 142A, 142B, 143, 144

Dramatic Art 15 (but not 15L), 20, 115, 150 through 159
 East Asian Studies 113
 Economics 1A-1B, 100, 101, 103, 104, 105, 110A through 136B, 151A through 175
 Education 110, 117, 120, 122, 123, 130, 132, 145, 153
 English 3, 4, 30A, 30B, 46A, 46B, 46C, 105A, 105B, 105C, 110A through 189
 Environmental Studies 101, 133, 160 through 162, 164 through 167, 175
 French 25, 101, 102, 103, 107, 112 through 133, 140, 141, 162
 Geography 2, 5, (2G, 5G when taken concurrently with 2 or 5), 6, 10, 50, 104, 120 (but not 120L), 121, 122A through 127, 131, 133, 141 through 162, 168, 170 through 173, 175
 German 48, 50, 51, 52A, 52B, 52C, 106, 110 through 133, 140, 141, 142C, 160, 165, 166, 176, 185
 Greek 100 through 116
 History 3 through 86, 101 through 104A, 110 through 191, 191D, 193 through 196B
 History and Philosophy of Science 20, 130A, 130B, 150
 Human Development 15, 19, 100A through 103, 110, 130, 131, 132, 151, 160
 Integrated Studies 1A, 2A, 2B, 2C, 2D, 2E, 3A, 3B, 3C, 3D, 3E, 8, 8B, 8C (Open only to students accepted to the Integrated Studies Program)
 International Agricultural Development 10, 103
 Italian 25, 50, 105, 107 through 145
 Japanese 10, 15, 25, 101 through 106, 108, 131 through 135
 Landscape Architecture 140
 Latin 100 through 116, 125
 Linguistics 1, 10 through 15, 50, 100, 102, 113, 115, 116, 120, 135, 138
 Medieval Studies 20A, 20B, 20C, 120A-F
 Military Science 21
 Music 3A, 3B, 4A, 4B, 4C, 5A, 5B, 5C, 10, 24A through 28, 109, 110A, 110B, 110C, 110D, 110E, 121, 122, 126, 129
 Native American Studies 1, 10, 32, 33, 55, 70, 101 through 191
 Nature and Culture 1
 Nutrition 20, 118
 Philosophy 1, 11, 13, 14, 17, 21, 22, 23, 24, 101 through 111, 114A through 127, 137, 143 through 177, 190
 Physical Education 36A, 36B
 Political Science 1 through 7, 100 through 113, 115 through 191
 Psychology 1, 16, 112, 114, 115, 120, 130, 131, 132, 135, 136 through 150, 165, 168, 171, 175, 177, 183
 Religious Studies 1 through 75, 100 through 178A-E
 Rhetoric and Communication 103 through 145, 152
 Russian 41, 42, 44, 121 through 154, 166
 Sociology 1, 2, 3, 4, 25, 107 through 185
 Spanish 100, 130 through 176
 Textiles and Clothing 107, 177
 Women's Studies 20, 50, 70, 80, 102 through 187

General Education electives are used to satisfy a campus requirement and are chosen from the list of General Education Courses for 1994-95 given earlier in this chapter. Since all engineering majors are in the Nature and Environment GE area, you must fulfill the campus requirement by taking courses in the Civilization and Culture and Contemporary Societies areas which broadly overlap Humanities and Social Sciences, respectively.

You should note that the requirement of 24 quarter units of Humanities and Social Science (HSS) coursework is a College of Engineering requirement and is in addition to the campus General Education (GE) requirement of a fixed number of courses. *You may satisfy the HSS and GE requirements simultaneously*, provided that you take the courses that are listed on both the list of HSS courses above and the GE courses list shown earlier in this chapter. In general, a good academic strategy is to satisfy the campus GE requirement first and then to satisfy any remaining HSS requirements by taking courses from the HSS list. In this way, you can benefit from the breadth and depth of course coverage inherent in the GE program structure. (For example, courses from areas outside of your major field of study are required and you must take coursework at both the lower division and upper division levels.)

In satisfying the GE requirement, note that (a) *you must take GE courses for a letter grade* and (b) *you must fulfill the Subject A requirement before you begin your GE coursework*. In consultation with your academic adviser, you should attempt to design a comprehensive and coherent set of courses using both the HSS electives and GE electives.

Technical electives permit you to tailor a program to your own academic and career objectives. For some, the technical electives offer the opportunity to prepare for a specific occupation. For others, they offer an opportunity to broaden a background in the sciences and engineering.

You may receive technical elective credit up to a maximum of 6 units for any combination of engineering courses numbered 190C, 192, 197, 198, and 199. Academic credit for 199 courses is limited to a maximum of 5 units for each substantially different project. Academic credit for engineering internship courses (192s) is limited to a maximum of 5 units per quarter.

With the exception of the following courses, all upper division courses in engineering, physics, chemistry, mathematics, and statistics may be taken as technical electives. The courses which may *not* be used are:

Applied Science Engineering 137 (restricted to one unit of technical elective)
 Physics 137 and 160 (restricted to one unit of technical elective), 194H, 195, 197T, 198, 199
 Chemistry 194H, 197, 198, 199
 Engineering 160 (restricted to one unit of technical elective)
 Mathematics 192, 197TC, 198, 199
 Statistics 102

In addition to engineering, physics, chemistry, mathematics, and statistics courses, the following courses may be taken as technical electives:

Agricultural Economics 100A, 100B, 113, 118A, 118B, 140, 147, 148, 155, 157, 171A, 171B, 175, 176
 Animal Science 41, 41L, 104, 105
 Applied Biological Systems Technology 161, 163
 Art Studio 121A
 Atmospheric Science 121A, 121B, 124, 128, 133, 149, 158
 Biological Sciences 1A, 1B, 1C, 101, 102, 103, 104, 120, 120P, 121, 121P, 122, 122P
 Chemistry 2C, 2CH, 8A, 8B

Economics 140
Environmental and Resource Sciences 100
Environmental Biology and Management 110
Environmental Studies 100, 128, 128L, 150A, 150B,
150C, 151, 155, 160, 167, 168A, 168B, 173, 178,
179
Environmental Toxicology 101, 131, 135, 155
Fiber and Polymer Science 100, 150, 161, 161L
Food Science and Technology 49, 100A, 100B, 101A,
101B, 102, 104, 108, 109, 110A, 110B, 111, 117,
119, 120, 120L, 121, 122, 125, 128, 131, 140, 150,
150L, 151, 156, 160
Geography 3, 4, 105, 106, 107, 108, 110, 112, 115,
116, 117
Geology 17, 50, 50L, 105, 117A, 117B, 134, 150A,
150B, 150L, 152
Management 11A, 11B
Microbiology 102, 102L, 130A, 130B, 130L, 177, 177L
Molecular and Cellular Biology 160L, 161, 170L
Neurobiology, Physiology and Behavior 2, any upper
division course
Soil Science 100, 102, 107, 111, 118, 120
Vegetable Crops 101, 105, 118 (any upper division
course except 150 or 190-199)
Water Science 103, 104, 122, 150, 180
Wildlife and Fisheries Biology 100, 102, 110, 110L, 111,
111L, 120, 120L, 121, 122, 130, 131, 136, 140, 151,
153, 154

You are urged to discuss the selection of technical
elective courses with your academic adviser.



Unrestricted electives. You may count any course for
which University credit is allowed as an unrestricted
elective in the engineering curricula.

Physical and Biological Science electives. Engi-
neering students are required to have 26 units in phys-
ical and biological sciences, typically 10 units of
chemistry and 16 units of physics. Students who trans-
fer into the College of Engineering with advanced
standing are required to complete 26 units of physical
and biological science by graduation, but need only
have completed 5-10 units of chemistry (depend-
ing on major) and 12 units of physics by the time of trans-
fer. Transfer students may make up the remaining 4
units by taking 4 additional units of chemistry, 4 addi-
tional units of physics, or 4 units in courses selected
from any of the curricula listed below, with the restric-
tions that follow.

Atmospheric Science
Biological Science
Chemistry
Evolution and Ecology
Geology
Microbiology
Molecular and Cellular Biology
Neurobiology, Physiology, and Behavior
Physics
Plant Biology

All courses in these departments numbered 10 and
190-199 are excluded for credit, as are the following
courses:

Evolution and Ecology 138
Geology 1-1G, 3-3G, 43, 113-113G, 116-116G, 131,
135, 144
Microbiology 20
Physics 137, 160
Plant Biology 191

Electrical Engineering and Computer Engineering stu-
dents should also use this list to identify the courses to
satisfy the mathematics/science electives. To identify
additional courses that may also satisfy this require-
ment, please refer to the Electrical Engineering and
Computer Engineering curricula outlines.

Degree Requirement Statements

Since engineering is a rapidly developing profession,
curricular changes are made by the faculty from year
to year. To ensure that you benefit from these changes,
the College of Engineering has established a policy that
you must fulfill the degree requirements stated in the
catalog for the year in which you complete degree work
or in the catalog for the year immediately preceding.

Degree Check

Use the Degree Requirement Check sheets for each of
the curricula for monitoring your progress toward a
degree. The Undergraduate Office will prepare only one
unofficial degree check for you (preferably at the end
of your junior year). To have this degree check pre-
pared, submit a signed Degree Check Request and
request an appointment. You can get further information
concerning this service and the forms for requesting a
degree check in the Engineering Undergraduate Office.

College of Letters and Science

Unit Requirements

A minimum of 180 units is required for the bachelor's degree. Of these units, 64 must be upper division units which include 48 units from Letters and Science teaching departments and programs. For the A.B. degree, a minimum of 12 of 48 units of upper division Letters and Science courses must be from outside the major department or program (see Area Requirement, A.B. degree entry, in this section for exceptions). All upper division General Education courses will be accepted in satisfaction of this latter requirement. Nonstandard courses (see Area Requirement, A.B. degree entry, in this section) do not count toward these 12 units.

Registration Beyond the 225-unit Limit. You are normally expected to fulfill all degree requirements within the 180- to 225-unit range. Once 225 units have been completed (excluding units awarded for College Board Advanced Placement Examinations), you may register only with the permission of the dean. Such permission is only rarely granted, and then typically only to allow completion of *minimum* degree requirements. You will be expected to adhere to a program of courses agreed upon and to meet other conditions that may have been set. Approval must be obtained before you will be permitted to register for courses for the quarter following completion of 225 or more units.

If you are in good standing, you will be able to complete 12 quarters or the equivalent (e.g., four years) of college work even if you have earned more than 225 units before you finish your fourth year. You must petition for continuation, however, and file the quarter-by-quarter course program you have planned.

Unit Credit Limitations

For certain courses, limits have been established on the number of units that can be counted towards the 180-unit minimum required for the degree. To avoid discovering just before graduation that you are short units, keep track of the number of units you have taken in each of the following categories.

Limitation on Credit for Graduate and Professional Courses. Undergraduates may enroll in graduate and professional courses in the 200, 300, and 400 series subject to the restrictions described in the Academic Information section in this catalog. Graduate and professional courses that have been completed will be listed on the student's transcript in the usual manner. *However, the units earned may be counted toward degree requirements only under the conditions listed below.*

Within the limitations A, B, and C given below, undergraduate students in the College may count an unlimited number of units in graduate 200 series courses and up to a combined total of 9 units in 300 and 400 series professional courses toward degree requirements. These units, however, are not counted as upper division units unless this is granted by petition to the dean.

A. The recommendations of the instructor in the course and the department chairperson—in addition to approval from the dean—must be obtained by petition in order to receive credit toward the degree for the following kinds of courses:

- all graduate courses 200–298 whether offered by a department or program outside of or within the College of Letters and Science
- all professional courses 300–398 for teachers offered outside of the College of Letters and Science
- all postgraduate professional courses 400–498 offered outside of the College of Letters and Science
- all variable unit courses 300–398 and 400–498 offered within the College of Letters and Science

B. The minimum eligibility conditions for an undergraduate student in the College to petition for degree credit for a 200, 300, or 400 series course are a UC grade point average of 3.3 and completion of 18 upper division units basic to the subject matter of the course. These eligibility conditions may be waived, however, upon the recommendation of the course instructor and concurrence of the department chairperson if the student's preparation warrants exception.

C. Undergraduates in the College cannot receive degree credit for special study courses 299, 399, or 499.

Limitation on Credit for Units Graded P. *Excluding courses that are graded on a Passed/Not Passed (P/NP) basis only, the number of units graded P that may be accepted towards a degree in the College of Letters and Science is limited to not more than one fourth of the units completed in residence on the Davis campus.*

The Academic Senate limits the *total* number of courses graded P, *including units earned in courses graded "P/NP only," to one third of the units completed on the Davis campus.* This limitation applies to *all* Davis undergraduates, including Letters and Science students.

Limitation on Credit for University Extension Courses. Students may apply credit earned in University Extension courses toward the 180-unit requirement only when written approval has been obtained from the dean before registration. The degree credit allowed by the dean for Extension courses is usually less than the unit value listed in the course description. A maximum of 9 units may be offered for elective credit only. Such units and courses may not be applied toward fulfillment of the Area, Foreign Language, Upper Division, or Residence requirements of the College. No grade points are assigned for courses completed in University Extension.

Other Unit Credit Limitations. The following are additional courses that have limits on the number of units that can be counted toward your degree.

Internship courses (numbers 92, 192): 12 units maximum including internship units taken at other institutions. (See under Nonstandard courses below.)

Nonstandard courses (92, 97T, 97TC, 99, 192, 194H, 197T, 197TC, 199 and similar courses): 30 units maximum or one-sixth of the units taken at UCD, whichever is the smaller. (Note the separate unit limits on internship, special study, and tutoring courses; and major limitations.)

Physical Education 1: 6 units maximum.

Special Study courses (99, 194H, 199): 5 units maximum in any one quarter. (See under Nonstandard courses above.)

Tutoring courses (97T, 97TC, 197T, 197TC): 10 units maximum. (See under Nonstandard courses above.)

Residence Requirement

While registered in the College of Letters and Science, a minimum of 27 upper division units, including 18 upper division units in the major, must be completed on the Davis campus. (Work completed while registered in the Education Abroad Program does not satisfy campus or College Residence requirements.)

Scholarship Requirement

The minimum grade point average to satisfy the scholarship requirement is 2.000 for all courses counted toward the major and for all upper division courses used to satisfy major requirements. Only grades earned in courses taken at UCD will be included in the grade point computations. To obtain these minimal averages in the major, you may repeat courses that are graded D or F. If you have to repeat a course more than once, you need the dean's approval.

English Composition Requirement

The English Composition requirement can be met in one of two ways:

1. by passing the English Composition Examination upon completion of 70 units of degree credit (the examination does not yield credit);

OR

2. by completing with a grade of C- (or P) or better
 - a. one course in English composition from English 1, 3, 20, Comparative Literature 1, 2, or 3;

and

- b. English 102 or 103 (which must be taken after 84 units have been completed).

Transfer Courses in English Composition. Transfer courses considered by the dean to be equivalent or comparable to English 1, 3, 20, 103A-G, or Comparative Literature 1, 2, 3 will be accepted toward satisfaction of the English Composition requirement. Note that English 103 or the equivalent must be taken after you have completed 84 units of transferable degree credit.

If your transfer work does not include an acceptable English composition course taken after you had completed or accumulated 84 units, you may fulfill the requirement by examination (see below) or take English 102 or 103 at UC Davis.

English Composition Examination. This academic year, the no-fee examination will be offered on the following Saturday mornings:

October 29, 1994
January 28, 1995
April 29, 1995

- There are no examinations administered during the summer.

Sign-up rosters will be posted on the College of Letters and Science Advising Office's bulletin board,



Social Sciences and Humanities Building, Monday through Thursday (or until filled) just before each Saturday examination date.

The English Composition Examination form, available at the UCD Bookstore, is required.

Area (Breadth) Requirement

The College Breadth Requirement promotes the intellectual growth of students by asking them to acquire a broader background of knowledge than is provided by the usual major. The Breadth requirement also guides students in exploring the interdependence of knowledge and, in the case of the A.B. degree, provides students the opportunity to become acquainted with performance in the fine arts.

A.B. degree—satisfaction of the campus General Education requirements **plus** completion of one of the following options:

- a. a "Mini Minor" consisting of a minimum of three **approved** upper division courses in a single Letters and Science department or program other than the major (and which are not offered in satisfaction of major requirements);

OR

- b. a minimum of three **approved** lower or upper division courses in Art, Music, or Dramatic Art from outside the student's major;

OR

- c. a certified minor from any UC Davis college or program.

The Letters and Science faculty believes that the completion of a certified minor is often the best way for a

student to obtain structure and coherence in pursuit of intellectual breadth.

For the purposes of options a and b above, all courses are considered as approved except: courses bearing less than 3 units of credit, internship courses, non-standard courses, directed group study courses, and courses used to satisfy the College English Composition Requirement.

Twelve units of *upper division* courses must be completed in Letters and Science teaching departments other than the major department or program. Courses numbered 92, 97T, 97TC, 98, 192, 197T, 197TC, 198, and from 200 through 499 cannot be counted toward satisfaction of the 12-unit requirement. Not more than 10 units in special study courses (194H, 199) may be counted.

B.S. degree—a total of 90 units in natural sciences/mathematics; and satisfaction of the General Education requirement.

Courses numbered 92, 97T, 97TC, 98, 192, 197T, 197TC, 198, and from 200 through 499 cannot be counted toward satisfaction of the natural sciences/mathematics Area requirements. A maximum of 10 units in special study courses (99, 194H, 199) may be counted toward that portion of the Area requirements. Courses used to satisfy the English Composition and Foreign Language requirements may not be counted toward the area requirement. Subject to the restrictions just listed, courses acceptable for fulfilling the 90-unit natural sciences/mathematics area requirement are as follows:

Natural Sciences and Mathematics

Anthropology 1, 5, 15, 151, 152, 153, 154A, 154B, 155, 156, 157, 158
 Astronomy
 Avian Sciences 13
 Biological Sciences: All courses except 19
 Chemistry
 Engineering 20
 Engineering: Civil and Environmental 30
 Engineering: Computer Science 10, 30, 40, 100, 110, 120, 122A, 140A, 170
 Engineering: Electrical and Computer 170
 Entomology 10, 100
 Environmental and Resource Sciences 2, 131
 Environmental Studies 30
 Evolution and Ecology
 Fiber and Polymer Science 110
 Food Science and Technology 2
 Geography 1, 3, 102, 108, 110, 112, 115, 116, 117, 118, 162
 Geology
 Human Anatomy 101
 Integrated Studies 1A, 1B, 8A
 Mathematics
 Microbiology
 Molecular and Cellular Biology
 Neurobiology, Physiology and Behavior
 Nutrition 10
 Physical Education 101, 102, 103, 110, 111, 112, 113, 115
 Physics
 Plant Biology

Psychology 15, 41, 103, 104, 105, 108, 129, 130, 131, 134, 136, 150, 154, 180B

Statistics

Wildlife and Fisheries Biology 10

Foreign Language Requirement (A.B. and B.A.S. degrees)

A.B. and B.A.S. degrees—the 15-unit level or the equivalent in one language.

B.S. degree—none.

Acceptable Languages. The Foreign Language requirement may be satisfied in any language offered at UCD, or for which transfer credit is allowed from another academic institution (including American Sign Language).

You may also satisfy this requirement by examination in a language not offered on the Davis campus. In this case, the Dean's Office will assist you in making arrangements to take an examination on another University of California campus, with a faculty member who teaches the language in question.

Satisfaction of the Requirement. Plan to complete the Foreign Language Requirement by the end of your first or second year, as program priorities permit. This is particularly important if you plan to apply for the University's Education Abroad Program.

The Foreign Language requirement may be satisfied by examination or completion of language courses as follows:

1. *Foreign Language Placement Test.* This test does not yield unit credit—it only determines whether the Foreign Language requirement has been met, or at which point in the language sequence you should enroll.

You may validate your knowledge of a language learned in high school by taking this test. A test may not be taken, however, in a language for which you have already received degree credit. If you are a transfer student, consult your *Status Card*, which is issued by the Dean's Office within a quarter after admission.

2. *College Board Achievement Test.* Earning a qualifying score of at least 550 on a College Board Foreign Language Achievement Test satisfies the requirement. This test may be taken at any time during your high school career. Once your score is on file at the Undergraduate Admissions Office, notify the Letters and Science Dean's Office so that satisfaction of the College requirement can be noted on your record.

3. *College Board Advanced Placement Examination.* A score of 5, 4, or 3 on any foreign language College Board Advanced Placement Examination, with the exception of Latin, taken in high school will satisfy the Foreign Language requirement.

4. *Course Completion in College (or the equivalent).* A.B. degree—15-unit level in one language (e.g., Spanish 3 or Japanese 3). B.S. degree—as required in the major program.

If you have successfully completed (C– or better) the second or third year of a language in the tenth or higher grade in high school you may receive unit credit for course 1 of that language on a P/NP grading basis only. Although a passing or nonpassing grade will be

charged to your P/NP option, no petition is required. [See "Passed/Not Passed (P/NP) Grading" in the Academic Information section.]

5. *Proficiency Examination.* If you have not completed the required level language course, but assume you have attained equivalent knowledge, you may satisfy the language requirement by passing a proficiency examination. For more information consult the appropriate foreign language department.

Major Program Requirements

Requirements for major programs are described in the Programs and Courses section of this catalog. These requirements are fulfilled by completing a major program offered by a teaching department or program committee in the College of Letters and Science (see the list of majors) or an individual major program approved by the College's Committee on Individual Majors.

No more than 6 units in internship courses (numbered 92, 192, or similar internship courses), may be accepted in satisfaction of the requirements of major programs. Courses numbered 97T, 97TC, 197T, and 197TC do not satisfy unit or course requirements in the major.

Change in Requirements

On occasion, the faculty makes changes in the requirements that students must satisfy to obtain the baccalaureate degree. So that you will not be penalized by changes that may work to your disadvantage and so that you will benefit by changes that assist you in completing your degree requirements, it is College policy that you may choose to fulfill the University and College requirements (see General Education requirement for an exception) as stated in any UCD *General Catalog* in effect at any time you were registered in a postsec-

ondary institution of higher education (i.e., community college, college, or university). Once you have chosen the year of the *General Catalog* under which you wish to be governed, you must satisfy all of the University and College requirements specified in that catalog.

With respect to the completion of your major requirements, most of the majors in the College of Letters and Science require completion of the major degree requirements in effect at the time you officially declared your major. However, because departments differ in how they handle these matters, check with the department or major program office if you have any questions about which requirements apply to you.

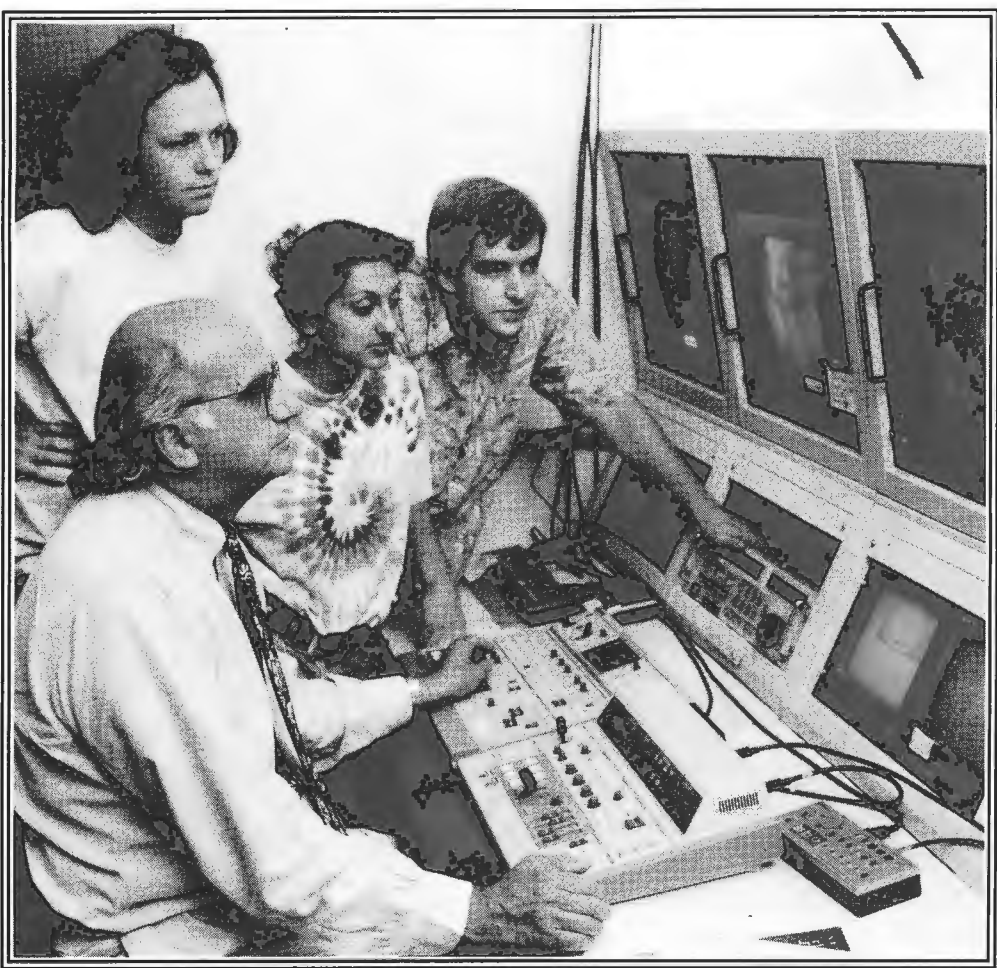
Degree Check

Before the beginning of your senior year, take some time to consider your goals and to plan the academic program for your final year as an undergraduate. To plan properly and to ensure that you get the most out of your remaining education and complete all graduation requirements as well, you should know what requirements remain unsatisfied. To help you in these efforts, the Letters and Science Advising Office provides informational materials and instructions on how to evaluate your progress on College and University requirements. You should also obtain a check of major requirements from your faculty adviser.

Once you have completed 135 units of degree credit, you should contact the Letters and Science Advising Office and your faculty adviser for a degree check. The Letters and Science Advising Office will provide each student with one official degree check summarizing your progress in fulfilling College and University requirements. You may request this degree check anytime during your final four regular quarters of registration before graduation.



GRADUATE STUDIES



UC Davis offers advanced degrees in more than 70 graduate programs. Students' graduate study is guided by either departments or graduate groups. Graduate groups are composed of individual faculty members with similar disciplinary or research interests. The group structure, used extensively at Davis, permits faculty to be affiliated with graduate programs in more than one discipline and offers students flexibility and breadth by crossing the administrative boundaries of the various departments, colleges, schools and sometimes campuses. In keeping with UCD's progressive spirit, the group structure also allows for expansion of established degree programs and facilitates the development of new ones. Almost half of the graduate programs at Davis are sponsored by graduate groups. You will find a list of the graduate degrees available at UC Davis in the front of this catalog.

Graduate study is administered by the Graduate Council, a standing committee of the Davis Division of the Academic Senate, and by the dean of Graduate Studies. A Universitywide Coordinating Committee on Grad-

uate Affairs determines general policies and establishes common procedures.

PREPARING FOR AN ADVANCED DEGREE

Admission to a graduate program at the University of California requires a bachelor's degree that is comparable to a degree from the University of California both in distribution of academic subject matter and in scholarship achievement.

The primary requirement for admission to any program is evidence of intellectual achievement and promise. Your application will be evaluated primarily on the basis of your transcript to assure that your qualifications meet minimum standards as set by Universitywide and UC Davis Graduate Councils. Generally, you must have a minimum B average in undergraduate course work from an institution of acceptable standing to be considered for admission. Graduate programs frequently require submission of additional materials such as a separate application form, Graduate Record Examination (GRE) scores, letters of recommendation, portfolios, or examples of written work to assist in selecting from among

	DEADLINES				
	FALL 1994	WINTER 1995	SPRING 1995	(SUMMER 1995) (for Sept. 1995)	FALL 1995
Deadline for filing applications for admission to graduate standing, with complete credentials, with the Dean of Graduate Studies					
United States residents	June 1				April 1
International students	May 1				March 1
Deadline for filing applications for readmission to graduate status with Graduate Studies	Aug. 2				Aug. 3
Deadline for students who expect to complete work for master's degrees to file applications for candidacy with the Dean of Graduate Studies	Sept. 23	Jan. 6	Feb. 24	June 1	Sept. 22
Deadline for candidates for master's degrees to file theses with the committee in charge	Nov. 1	Feb. 1	May 1	July 21	
Deadline for candidates for master's degrees to file theses with the Dean of Graduate Studies	Nov. 30	Mar. 2	June 1	Sept. 1	
Deadline for candidates for master's degrees to file final report on comprehensive examination with the Dean of Graduate Studies	Dec. 16	Mar. 24	June 16	Sept. 8	
Deadline for students who expect to complete work for the degrees of Doctor of Philosophy and Doctor of Engineering to file applications for candidacy with the Dean of Graduate Studies	Aug. 12	Nov. 11	Feb. 3	May 19	Aug. 11
Deadline for candidates for the degrees of Doctor of Philosophy, Doctor of Education, and Doctor of Engineering to file theses with the committee in charge	Oct. 3	Jan. 4	Apr. 3	July 3	
Deadline for candidates for the degrees of Doctor of Philosophy, Doctor of Education, and Doctor of Engineering to file theses with the Dean of Graduate Studies	Nov. 30	Mar. 2	June 1	Sept. 1	

qualified applicants. Admission to graduate study is limited by the number of spaces available in major programs. Not all eligible applicants can be admitted.

UC Davis is committed to maintaining excellence, preserving fairness, and promoting diversity in its student population. In addition to an applicant's past scholastic achievement, admissions criteria include an applicant's potential for service in the field, keeping in mind the needs of our society and of underrepresented and disadvantaged communities. Criteria also attempt to take into account any prior disadvantages applicants have experienced that may bear on future achievements and services.

FEES

At the time of registration each quarter, every student must pay the following fees.

These are the proposed fees for the 1994-95 academic year. Because they are subject to legislative and gubernatorial action, these fees may change without notice.

Graduate Student Fees

University Registration Fee*	\$239.00
Memorial Union Fee	28.50
Graduate Student Association Fee.....	6.50
Health Insurance Fee.....	142.50
Educational Fee**	1121.00
Total for California residents.....	\$1,537.50

Tuition for nonresidents	2,566.00
Total for nonresidents	\$4,103.50

* University Registration Fee = \$237.00 in winter and spring quarters.

** Educational Fee = \$1120.00 in winter and spring quarters.

Graduate students must purchase the Graduate Student Health Insurance Plan unless they are able to prove comparable coverage under another plan.

The Graduate Student Association Fee is optional for students in the Schools of Law, Medicine, and Veterinary Medicine. Law students are required to pay a Law Student Association Fee of \$8.00 per semester.

APPLYING FOR ADMISSION

Applications normally are accepted for fall quarter only. Combined admission and fellowship application forms are available from Graduate Studies, University of California, Davis, CA 95616. You should begin the application process as early as possible in the academic year, since many programs have early deadlines. In addition, your chances for employment as a teaching or research assistant or of receiving financial support are greatly enhanced by applying early. The application deadline is April 1, unless otherwise indicated by the program, or until your proposed graduate program is full, whichever occurs first.

The completed application form, along with the \$40 nonrefundable application fee and official transcripts from each college and university you have attended, must be sent directly to Graduate Studies. Supplemental application materials required by the graduate program must be sent directly to the graduate adviser for that program.

When all application materials have been received by Graduate Studies, they will be forwarded to your proposed major program where they will be evaluated along with the supplemental materials you have sent to the program adviser. The Graduate Admissions Advisory Committee for the program will submit its recommendation and evaluation to Graduate Studies; final admission decisions rest with the dean of Graduate Studies. This approval procedure applies to all applicants, including those seeking a transfer to UC Davis from another UC campus.

Applications for the degrees of Juris Doctor, Doctor of Medicine, Doctor of Veterinary Medicine, Master of Business Administration, and Master of Preventive Veterinary Medicine must be filed directly with the appropriate professional school.

Readmission

If you were formerly registered at UCD as a graduate student and wish to return to the same degree program and major, you must apply for readmission and pay the readmission application fee of \$40. The readmission application must be filed with Graduate Studies at least eight weeks before the beginning of the fall quarter (see the Academic Calendar at the front of this catalog). Readmission to quarters other than fall is granted on an exception basis by special petition to the dean of Graduate Studies. If you are seeking to return to a new degree program and/or new major, you must apply for admission along with other new applicants. Obtain an application from the Graduate Studies Office. Transcripts of all work undertaken since you were last registered in graduate status at Davis must be presented with the application. (There is no assurance of reentry, as applicants for readmission will be considered in competition with other applicants for the program.)

International Students

Assessment of a foreign degree is based on the characteristics of the national system of education, the type of institution attended, and the level of study completed.

If you are an international student with credentials from universities outside the U.S., you should begin the application process as early as a year in advance. Official copies or certified copies of all transcripts in English and in the original language are required before your application can be processed. Completed applications along with the nonrefundable \$40 application fee must be received from international students by March 1, unless your proposed program has an earlier deadline.

English Requirement. If English is not your native language and you have not studied at an institution where English was the language of instruction, you will be required to demonstrate proficiency in English by submitting your test scores from the Test of English as a Foreign Language (TOEFL). This test is given six times each year by the Educational Testing Service, CN6151, Princeton, NJ 08541-6151. The minimum score required for admission to graduate study at UC Davis is 550.

Visas. If you need a certificate of eligibility for a student visa issued by UC Davis, you will be required to complete a certification of finances form showing the availability of sufficient funding for your graduate program (see under "International Student Services" in the

Academic Advising section for complete details). No financial aid of any kind (grants, loans, fellowships, scholarships, or work-study awards) is available to international students during their first year of registration at UC Davis.

PROGRAM OF STUDY

New students are assigned an adviser within the appropriate department or graduate group who assists them in planning a program of study. The program will depend to some degree on the student's undergraduate training and may include undergraduate courses to remove deficiencies. Each student must satisfy the degree requirements as published in the *Graduate Program Directory*, or as documented by the program. Additional requirements for study may be established by the department or group and approved by the Graduate Council. These requirements often include a core of required courses, but considerable flexibility is permitted to suit individual needs. Undergraduates at Davis who plan to pursue graduate study should consult with their major adviser early in their senior year to guarantee adequate preparation.

A graduate degree is awarded to recognize a student's command of a wide range of knowledge in an academic field. It is not awarded merely for the fulfillment of technical requirements, such as residence, or the completion of specific courses.

Master's Degree

Students working toward a master's degree must be registered in residence for at least three quarters. Two regular six-week Summer Sessions may count as the equivalent of one quarter. Usually, all work for the master's degree is done in residence on the Davis campus. With the consent of the graduate adviser and the dean of Graduate Studies, however, some work taken elsewhere may be credited toward your degree. The normal limit for such transfer credit is 6 units from another institution, or 12 concurrent units, or up to one half of the unit requirement if the courses were taken at another campus of the University—providing the units were not used to satisfy requirements for another degree.

A master's degree may be awarded upon completion of one of two basic plans in which either a thesis or a comprehensive examination is required.

Ph.D. Degree

The Doctor of Philosophy degree, as granted at the University of California, means that the recipient possesses knowledge of a broad field of learning and has given evidence of distinguished attainment in that field; it is a warrant of critical ability and powers of imagination and synthesis. It means, too, that the candidate has presented a dissertation containing an original contribution to the knowledge of the chosen field of study.

Students working toward a doctorate must be registered and in University residence for a minimum of six regular quarters. Experience indicates that it takes considerably longer than this to complete a degree program. Two consecutive regular Summer Sessions may count as the equivalent of one regular quarter.

There is no University unit requirement for the doctoral degree. However, individual programs have course requirements that must be completed before admission to the qualifying examination.

The qualifying examination is administered by a committee appointed by the dean of Graduate Studies. The examination is intended to demonstrate critical thinking ability, powers of imagination and synthesis, and broad knowledge of the field of study. Upon recommendation of the Qualifying Examination Committee, and with the approval of the Graduate Council, the examination may be repeated one time.

After successful completion of the Qualifying Examination, the student must file for Advancement to Candidacy for the degree. At this time, a committee is appointed to direct the research problem and guide in the preparation of the dissertation.

Graduate students in certain Ph.D. programs may participate in a **Designated Emphasis**, a specialization that might include a new method of inquiry or an important field of application which is related to two or more existing Ph.D. programs. The Designated Emphasis is awarded in conjunction with the Ph.D. degree and is signified by a transcript designation; for example, "Ph.D. in History with a Designated Emphasis in Critical Theory." Programs approved as Designated Emphases include: Feminist Theory and Research; International Nutrition; Computational Science; Critical Theory; Economy, Justice and Society; Native American Studies; and Social Theory and Comparative History.

INTERCAMPUS EXCHANGE PROGRAM

A graduate student registered on any campus of the University may become an intercampus exchange student with the approval of the graduate adviser, the chairperson of the department or group on the host campus, and the dean of Graduate Studies on both the home and the host campuses.

An intercampus exchange student has library, health service, and other student privileges on the host campus, but is considered a graduate student in residence on the home campus. The grades obtained in courses on the host campus are transferred to the home campus and entered on the student's official graduate transcript.

Application forms may be obtained at the Office of the Dean of Graduate Studies and should be submitted six weeks before the beginning of the quarter in which you wish to participate in the program.

FELLOWSHIPS, ASSISTANTSHIPS, AND LOANS

Fellowships are awarded on the basis of scholarship and promise of outstanding academic and professional contribution. Applicants for admission who wish to be considered for a fellowship or graduate scholarship must file the combined Application for Admission and Fellowship no later than January 15 preceding the fall quarter to be attended. These applications are considered only once a year. If you are continuing in grad-



uate status at Davis you must file an application for fellowship and graduate scholarship for continuing students with the chairperson of your graduate program on or before January 15. International students are not eligible for fellowship consideration until they have completed one year as a graduate student at UC Davis. Information regarding graduate fellowships, which are supported by various federal and outside agencies, is available at Graduate Studies.

A limited number of Nonresident Tuition Fellowships are awarded each year to new nonresident U.S. citizens, permanent residents of the U.S., and continuing international students based on academic merit. The available fellowships are allocated to graduate programs which choose individual recipients from among their graduate students. A minimum grade point average of 3.25 is required for eligibility. Application forms for Nonresident Tuition Fellowships are available at Graduate Studies or your graduate program, and must be filed with the chairperson of your graduate program by January 15. Students receiving any funding from a government or other outside agency, whether or not the fees are paid directly to the University of California, are not eligible for a fellowship.

Teaching assistantships and research assistantships are available in many departments. Interested students should inquire at the office of the program in which they wish to work.

The Financial Aid Office has information about loans, grants, and work-study for graduate students.

GRADUATE CERTIFICATE PROGRAM FOR ENGINEERS

For engineers who already have a degree, the College of Engineering offers a Graduate Certificate Program. This program consists of coursework in selected engineering subjects, and requires fewer units than the degree programs. The purpose of the Graduate Certificate Program is to provide practicing engineers with an opportunity to develop additional expertise in specific areas and to explore new fields of technical interest.

General requirements for the program are

- 15 or 16 units of specified graduate coursework, or a combination of specified graduate and undergraduate coursework
- Admission to Graduate Studies

Further information on the Graduate Certificate Program may be found in the *College of Engineering Bulletin*.

TEACHER CREDENTIAL PROGRAMS

The Division of Education offers programs for students interested in becoming elementary or secondary teachers. The elementary education program prepares you to teach all the subjects commonly taught in an elementary classroom. In addition, it offers the option of receiving in-depth training for teaching in a bilingual (Spanish) or English as a Second Language classroom. The secondary education program is designed to prepare teachers who will work in grades 7 through 12 in the following areas: agriculture, English, foreign language, (Spanish), physical and life science, math, music, phys-

ical education, and social studies education.

To apply you need to have done the following:

- completed a bachelor's degree,
- completed most of the required course work in the area you want to teach, or have taken a National Teacher Exam (NTE) in the area you want to teach,
- taken the California Basic Education Skill Test (CBEST),
- worked with school-age children, and
- met Graduate Studies minimum GPA requirement (3.0).

There are additional requirements that we encourage you to take as undergraduates. Information is available in the Student Services Office, 2078 Academic Surge, 916-752-0758.

The teaching credential program starts in the fall quarter only and is nine months long. It is a full-time professional program with a rigorous schedule. Student teachers are in classrooms in the morning and early afternoon and back on campus in the afternoon and evening for coursework. The student teaching assignments generally are in the following communities: Davis, Winters, Woodland, Dixon, Vacaville, Fairfield, Sacramento, and West Sacramento. Student teachers are required to participate in the schools in the role of a regularly credentialed teacher. A typical course schedule follows:

- student teaching
- teaching methods courses [on how to teach your subject area(s) and grade level(s)]
- reading methods course
- computer education course
- health education course
- special education course

Upon satisfactory completion of all requirements, you will be recommended to receive a California teaching credential.

Applications and filing deadlines should be obtained from the Division of Education, 2078 Academic Surge, University of California, Davis, CA 95616-8579 or the Department of Applied Behavioral Sciences (agricultural education), Hart Hall, University of California, Davis, CA 95616-8523.

The teacher education program is also available to upper division students who have a 3.3 GPA and room in their schedule for a full-time teaching program. Satisfactory completion of your degree and the credential program would entitle you to a nonrenewable **preliminary** credential. Within five years you must complete a graduate year of study to be eligible for an additional credential. Specific requirements may be obtained from the Student Services staff in the Division of Education.

Students considering teaching as a career should consult the Division of Education or the Department of

Applied Behavioral Sciences **as early as their freshman year.** Because of the complexity of the Teacher Preparation and Licensing Law and the requirements of Davis campus programs, students are encouraged to maintain close contact with education advisers throughout their undergraduate years.

PROGRAM IN COLLEGE TEACHING

The Program in College Teaching provides graduate students interested in college and university teaching the opportunity to improve their teaching skills and gain familiarity with a wide range of issues important to a faculty career. The program focuses on teaching in the participant's own discipline area. Direction and instruction are predominantly provided by a faculty mentor selected by the participant. Successful participants earn a certificate of completion and an appropriate annotation is added to their University transcripts. They also have the opportunity to construct a well-developed teaching portfolio for prospective employers.

The heart of the program is co-teaching with a faculty mentor. Many participants choose UC Davis faculty members as their mentors and do their teaching on the Davis campus. Participants considering a career at a community college or at a four-year teaching college are encouraged to find faculty mentors and teaching opportunities at cooperating colleges nearby, thereby developing contacts and references at institutions similar to those at which they intend to eventually teach. Participants also complete individualized learning contracts and attend regularly scheduled "Teaching Roundtables."

The Program in College Teaching is administered through the Office of Graduate Studies and the Teaching Resources Center. The program begins in late spring quarter, lasts until the end of the following spring quarter, and is designed to fit into the student's existing schedule. Further information may be obtained from the Teaching Resources Center, 17 Wellman Hall, University of California, Davis, Davis, CA 95616-8717.

SCHOOL OF LAW



Information:
Dean's Office
School of Law
1011 King Hall
916-752-0243

The School of Law offers a three-year professional curriculum leading to the degree of Juris Doctor. In addition to the traditional professional curriculum, the School provides professional skills training in interviewing and counseling, negotiation and dispute resolution, and trial practice. It also offers opportunities for practical experience through clinical programs and for in-depth study of an area of law in an individualized program of classroom work, research, writing, or experience in the community. The School seeks to promote critical evaluation of law and legal institutions in a broad perspective, integrating non-legal disciplines with professional legal education.

The School is fully accredited by the American Bar Association, is a member of the Association of American Law Schools, and has a chapter of the Order of the Coif.

PREPARATION FOR THE STUDY OF LAW

No specific college major is required for admission to the School of Law, and there is no prescribed pre-legal program. Your college record and Law School Admission Test (LSAT) score must, of course, demonstrate that you are highly qualified for the study of law.

As a pre-law student, you should plan a course of study that will give you a broad cultural background and include intensive work for a substantial period of time in a selected field of study. Pre-law students should develop the ability to think critically. They should gain an understanding of people and institutions and know how to gather and weigh facts, to solve problems, and think creatively. They should be able to read rapidly with comprehension, and express themselves clearly, completely, and concisely, both orally and in writing.

Assistance in program planning may be obtained from the Pre-Law Advising Office, South Hall, 916-752-3009.

For additional information, see the *Official Guide to U.S. Law Schools*, published annually and prepared by the Law School Admission Council and the Association of American Law Schools. This book includes material on the law and lawyers, pre-law preparation, applying to law school, and the study of law, together with individualized information on all ABA approved law schools. It may be found at college bookstores or ordered from Law Services, Box 2400, Newtown, PA 18940-0977.

FEES

At the time of registration each semester, every student must pay the following fees.

These are the proposed fees for the 1994-95 academic year. Because they are subject to legislative and gubernatorial action, these fees may change without notice.

Law School Fees—Entering Students*

University Registration Fee.....	\$356.50
Memorial Union Fee.....	42.75
Law Student Association Fee.....	8.00

Health Insurance Fee**.....	213.75
Educational Fee.....	1,680.50
Professional School Fee.....	1,188.00
Total for California residents.....	\$3,489.50

Tuition for nonresidents.....	3,849.50
Total for nonresidents.....	\$7,339.00

Law School Fees—Continuing Students*

University Registration Fee.....	\$356.50
Memorial Union Fee.....	42.75
Law Student Association Fee.....	8.00
Health Insurance Fee**.....	213.75
Educational Fee.....	1,680.50
Professional School Fee.....	188.00
Total for California residents.....	\$2,489.50

Tuition for nonresidents.....	3,849.50
Total for nonresidents.....	\$6,339.00

*Continuing students are those who were enrolled spring quarter 1994. PELP students are considered continuing students. Students who withdraw and later apply and are accepted as re-admitted students are considered new (entering) students. Entering students are those who were not previously enrolled in the School of Law.

** Students must purchase the Graduate Student Health Plan unless they are able to prove comparable coverage under another plan.

APPLYING FOR ADMISSION

February 1 Deadline for filing applications for admission for 1995-96 to the School of Law

1. Request application forms and the School catalog from the Office of Admissions, School of Law, University of California, Davis, CA 95616-5201. Return your completed application to that office, plus a \$40 non-refundable application fee, in the form of a check or money order made payable to the Regents of the University of California.

The last date for filing completed application forms, together with all supporting documents, including LSAT scores, Law School Data Assembly Service (LSDAS) reports, and letters of recommendation, is *February 1* of the year in which admission is sought. Early filing of all application materials is strongly recommended and will materially assist the School of Law Admissions Committee in its considerations. Applications postmarked after February 1 will be returned to the applicant.

2. You must take the Law School Admission Test and submit the Law School Application Matching Form with your application so that the score will be reported to the school. You are urged to take the test as early as possible, and no later than December preceding the year in which admission is sought.

Testing centers are located in all parts of the United States and in many foreign countries. Tests are given four times a year: February, June, October, and December. The completed test application blank, accompanied by the required fee, must be postmarked at least 30 days before the date of the test to ensure that you will be registered for that test date.

To obtain application forms, information about the test, specific test dates, and the location of testing centers, write to: Law Services, Box 2000, 661 Penn Street, Newtown, PA 18940-0998. The information booklet is also available in the Law School Admission Office and the Pre-Law Advising Office on campus.

3. Register with the LSDAS no later than December 1 by completing and mailing the registration form supplied in each LSAT-information book. Have a transcript from each college or university you have attended sent directly to Law Services, Box 2700, 661 Penn Street, Newtown, PA 18940-0978.

4. Submit an official transcript of college work completed during the first semester or quarter of your senior year directly to the School of Law *as soon as it is available*. Failure to do so may delay consideration of your application materials. Successful applicants must submit directly to the School of Law a final transcript showing the award of a bachelor's degree.

5. Provide two letters of recommendation from objective and responsible persons to whom you are well known. At least one of these letters should come from a faculty member under whom you studied while in college. These letters of recommendation should be enclosed in sealed envelopes, the recommender must sign across the seal, and the letters should be submitted along with the application for admission; or they may be sent directly from a college placement center, career center, or college pre-law office. Your application cannot be considered until two letters have been received.

Your application will be reviewed by the School of Law Admissions Committee, which seeks students of demonstrated academic ability, as evidenced by LSAT scores and the undergraduate grade point average (GPA). The committee seeks students of diverse backgrounds and considers ethnic and economic factors, advanced degrees or other advanced studies, significant work experience, and extracurricular and community activities during and after the college years. An applicant's growth, maturity, and commitment to the study of law are also major considerations.

Students are admitted only on a full-time basis and *only in August*.

6. When accepted by the School of Law, you are simultaneously admitted to Graduate Studies on the Davis campus of the University for the program leading to the degree of Juris Doctor. If you intend to pursue studies leading to other graduate degrees, or wish to become a candidate for a Combined Degree Program (see below), you must make separate application to Graduate Studies before commencing such studies.

Admission to Advanced Standing

If you have completed at least one year of work in another approved law school, you may be considered for admission to advanced standing with credit for not more than one year of such work. The applications filing period is June 1–30. No application for advanced standing will be considered until the Office of Admissions has received transcripts for all prior law school work.

Application procedures for advanced standing are the same as described above with the addition of (1) a letter of good standing including class rank from the dean of any law school previously attended; (2) at least one letter of recommendation from a law professor; (3) transcripts of all law school work; (4) LSAT score (no need to register with LSDAS—a copy of the report previously submitted to the school you are presently attending will suffice); and (5) an official transcript from the school where you earned your undergraduate degree, stating the date the degree was conferred. The deadline for transfer applications is *June 30* of the year for which transfer is sought. Committee decisions on advanced standing are normally made in late July or early August of the year in which admission is sought.

Students who have been disqualified at another law school will not be admitted to this school.

Recruitment of Underrepresented Groups

The students and faculty of the UCD School of Law recognize the great need for lawyers from under-



represented groups. The School, therefore, actively solicits applications from Asian, African American, Hispanic, American Indian, Filipino, and other underrepresented students.

The School of Law, in cooperation with the Association of American Law Schools (AALS) and the Council on Legal Education Opportunity (CLEO), participates in programs designed to increase the number of law students from underrepresented groups. CLEO applications may be obtained by writing to: Council on Legal Education Opportunity, 818 18th Street N.W., Suite 940, Washington, D.C. 20006.

Scholarships for Indian and Alaskan natives are available from American Indian Graduate Center, 4520 Montgomery Blvd., N.E., Suite 1B, Albuquerque, New Mexico 87109, (505) 881-4584. Applicants must be members of federally recognized Indian tribes or Alaskan native villages and must demonstrate need. The deadline for the fall term is April 30.

The Mexican-American Legal Defense and Education Fund (MALDEF) has monies available for Chicano students who have applied to law school. Applications may be obtained by writing to: Mexican-American Legal Defense and Education Fund, 182 2nd Street, 2nd Floor, San Francisco, CA 94104.

PROGRAM OF STUDY

The course of study in the professional curriculum requires six semesters for completion and extends over a period of three years. It is designed for full-time students only; no part-time or evening program is offered. New students are admitted only at the beginning of the fall semester.

After satisfactorily completing the professional curriculum of 88 semester units, and the required period of resident study, you will receive the degree of Juris Doctor.

The first year's work is prescribed and provides the essential foundation for subsequent legal study. Satisfactory completion of the first-year courses is, in all cases, prerequisite to second- and third-year courses. The work of the second and third years is elective. Students who fail to attain satisfactory grades may be required to withdraw from the School at the end of any academic year.

Courses taken in summer sessions at other accredited law schools may, with prior permission, be credited toward the units required for the professional degree.

The courses of the professional curriculum are listed in the Programs and Courses section of this catalog.

Combined Degree Programs

Students with interests in areas such as anti-trust, business, labor law, criminal law, or environmental law, may find a combined degree involving law and another discipline such as economics, business, sociology, or science advantageous. In order to encourage this kind of study, the School, in conjunction with other schools and University departments, has established Combined Degree Programs. Under these programs, a student may work toward a J.D. degree and a master's degree in another discipline at the same time. In some instances it may be possible to work on a Ph.D. degree as well.

Normally, a Combined Degree Program will take at least four years. You will usually be able to earn up to 10 semester-hours of law school credit for work in the related discipline and normally can complete the combined degrees in less time than it would take to earn the two degrees separately. The first year of the Combined Degree Program must be taken entirely in the School of Law. During the remaining years, coursework may be divided between the Law School and the related discipline. You must satisfy the admission requirements for both programs and file applications with both units.

Students have pursued degree programs in combination with UCD departments for the M.A. degree in economics and sociology, and with the School of Management for the M.B.A. degree. The Law School will attempt to work out an additional program if you are interested in other disciplines. You may enroll in the Combined Degree Program any time before the beginning of your third year in law school. If you are interested in pursuing a Combined Degree Program, and have made a separate application to another school or department, you should notify the School of Law if that application is accepted.

SCHOOL OF LAW CALENDAR

The School of Law operates on a semester system rather than the quarter system used on the remainder of the Davis campus.

Academic Calendar 1994-95

	FALL 1994	SPRING 1995*
First-year Introductory Program	Mon-Fri, Aug 15-19	
Law School instruction begins	Mon, Aug 22	Mon, Jan 9
Labor Day holiday	Mon, Sept 5	
Thanksgiving holiday period	Thurs-Fri, Nov 24-25	
Martin Luther King, Jr. holiday		Mon, Jan 16
President's Day holiday		Mon, Feb 20
Spring recess		Mon-Fri, Mar 27-31
Law School instruction ends	Fri, Dec 2	Fri, April 28
Reading period	Sat-Wed, Dec 3-7	Sat-Thurs, April 29-May 4
Law School examination period	Thurs-Wed, Dec 8-21	Fri-Fri, May 5-19
Last day of semester	Thurs, Dec 22	Fri, May 19
Law School Commencement		Sat, May 20

*Friday, February 24 is treated as a Monday for class schedule purposes.

SCHOOL OF MANAGEMENT



Information:
Graduate School of Management
106 AOB 4
916-752-7399

The Graduate School of Management offers a full-time, two-year program leading to the Master of Business Administration degree. The program provides both entry-level and mid-career students with an understanding of management approaches to problem solving and an awareness of the environment within which public and private management decisions are made. Successful completion requires not only a sophisticated understanding of a variety of functional skills in finance, marketing, production, program evaluation and accounting, but also an understanding of computers, information systems and the application of scientific methods to the identification and solution of management problems.

PREPARATION FOR THE STUDY OF MANAGEMENT

A bachelor's degree and a strong interest in professional management are prerequisites for admission to the Graduate School of Management. The school seeks students from diverse professional and academic backgrounds and does not limit its consideration to applicants from any particular category of majors. Entry-level and mid-career applicants are considered, and women and minorities are encouraged to apply.

Although the program has no specific subject prerequisites, it is *strongly recommended* that students complete the following coursework before enrollment in the program:

Accounting—introductory course which discusses basic concepts.

Economics—introductory courses in micro- and macro-economics, and one upper division course in micro-economics.

English—a business communication course.

Mathematics—an introductory course in calculus.

Statistics—one course in elementary statistics.



FEES

At the time of registration each quarter, every student must pay the following fees.

These are the proposed fees for the 1994-95 academic year. Because they are subject to legislative and gubernatorial action, these fees may change without notice.

Graduate School of Management Fees— Entering Students*

University Registration Fee**	\$239.00
Memorial Union Fee	28.50
Health Insurance Fee†	142.50
Educational Fee‡	1,121.00
Professional School Fee§	668.00
Total for California residents	\$2,199.00

Tuition for nonresidents	2,566.00
Total for nonresidents	\$4765.00

Graduate School of Management Fees— Continuing Students*

University Registration Fee**	\$239.00
Memorial Union Fee	28.50
Health Insurance Fee†	142.50
Educational Fee‡	1,121.00
Total for California residents	\$1,531.00

Tuition for nonresidents	2,566.00
Total for nonresidents	\$4,097.00

*Continuing students are those who were enrolled spring quarter 1994. PELP students are considered continuing students. Entering students are those who were not previously enrolled in the School of Management. Students who withdraw and later apply and are accepted as re-admitted students are considered new (entering) students.

** University Registration Fee = \$237.00 in winter and spring quarters.

† Students must purchase the Graduate Student Health Plan unless they are able to prove comparable coverage under another plan.

‡ Educational Fee = \$1120.00 in winter and spring quarters.

§ Professional School Fee = \$666.00 in winter and spring quarters.

APPLYING FOR ADMISSION

April 1 Deadline for filing applications for admission for 1995-96 to the School of Management

Admission is for the fall quarter only. Application materials may be obtained from the Graduate School of Management, University of California, Davis, CA 95616. Complete and return your application, with all supporting documents, by *April 1*. The application fee is \$40.00. Completed applications for fellowship and graduate scholarships must be filed by *January 15*.

Students interested in admission to the school are urged to request an *Announcement of the Graduate School of Management* at an early date so that all minimum academic requirements and deadlines are met.

In addition to your application, you will need to submit:

- Transcripts from all colleges or universities previously attended.
- Scores from the Graduate Management Admission Test (GMAT). Applicants must take the GMAT no later than March. In order to be considered for fellowships and scholarships, applicants must take the October test to meet the January 15 deadline. For fur-

ther information and registration forms contact: Graduate Management Admission Test, Educational Testing Service, CN 6108, Princeton, NJ 08541-6108, 609-771-7330.

- Three letters of recommendation. Applicants currently enrolled in school should include one recommendation from a professor. For individuals who are out of school, recommendations from employers or business associates are acceptable.
- A writing sample and a personal statement which discusses career objectives and educational reasons for seeking admission to the program.

Personal interviews are not required, although visits from applicants are welcomed.

International Students

Foreign students for whom English is a second language must take the Test of English as a Foreign Language (TOEFL) by March 1, and receive a score of 600 or better. Registration forms may be obtained by writing to: TOEFL, Educational Testing Service, Box 899, Princeton, NJ 08541-6108.

Criteria for Admission

The major criterion of the committee granting admission is what an applicant has to gain from, and offer to, the program. Consideration of an applicant's undergraduate performance includes a review of trends in scholastic performance and areas of academic strength as well as an assessment of overall grade point averages. Admissions standards and grading policies of the schools attended are also considered. Both verbal and quantitative scores on the GMAT are used to evaluate measurable general aptitude for management. Background and maturity as indicated by employment history, service and activity records, recommendations, and the applicant's personal statement are factors in the committee's evaluation. Professional management experience is not required for admission but is favorably considered.

PROGRAM OF STUDY

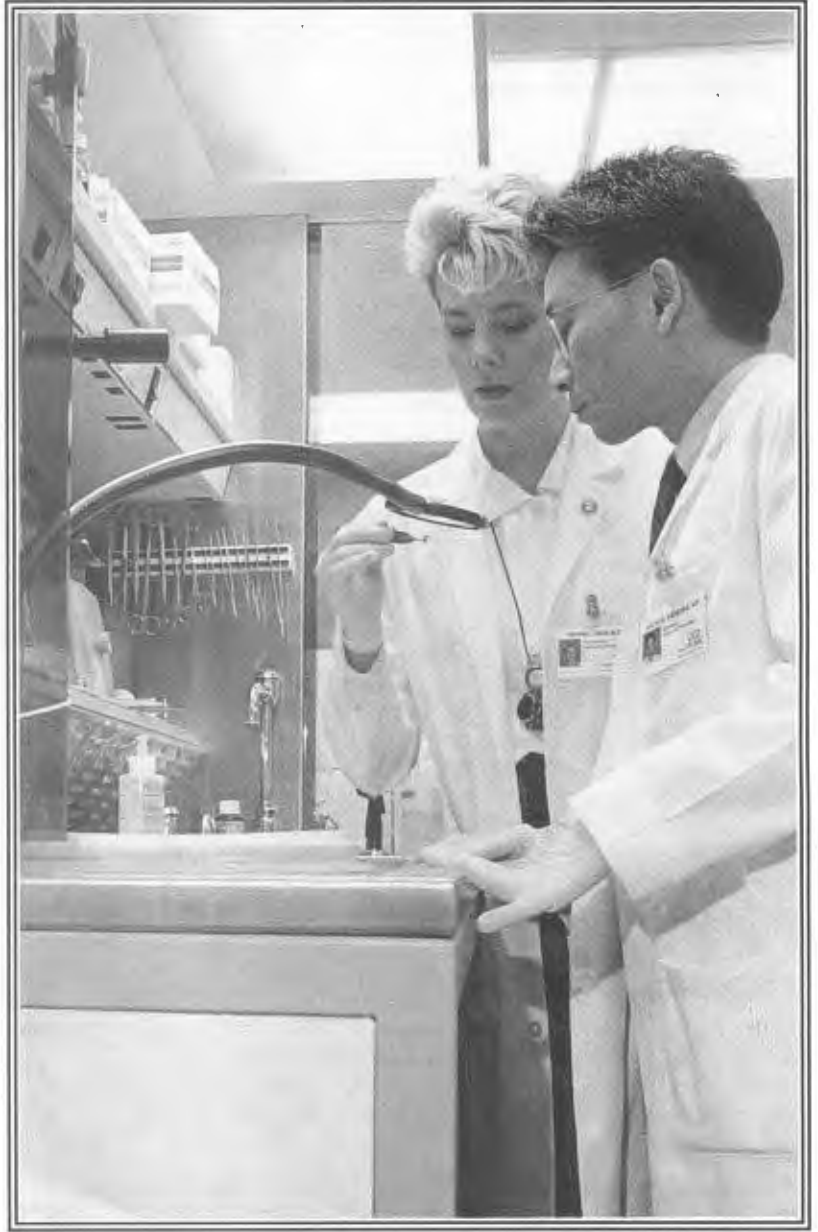
In the first year, the program offers a series of core courses that focus on all the basic disciplines of business—accounting, economics, finance, marketing, organizational behavior, decision sciences, and information systems.

The second year of the program allows students to take courses in individually selected concentrations. These concentrations include accounting, agricultural management, environmental and natural resource management, finance, management information systems, management science, marketing, public sector management, and science and engineering management. Students may also design their own concentration.

In addition to the above full-time program, the Graduate School of Management offers an evening M.B.A. program for working professionals (WP MBA). If you would like more information about the evening program, please contact the Graduate School of Management Admissions Office at 752-7399.



SCHOOL OF MEDICINE



The Doctor of Medicine degree requires the satisfactory completion of a four-year course of study composed of 15 consecutive quarters. Course work is conducted on the Davis campus, at the University of California, Davis, Medical Center, Sacramento; and in nearby affiliated hospitals.

PREPARATION FOR THE STUDY OF MEDICINE

When you apply to the School of Medicine, you must submit the results from the New Medical College Admission Test (MCAT), so it is recommended that you take the MCAT by the spring before application. Information can be obtained at your undergraduate institution or directly from MCAT Program, Box 24720, Oakland, CA 94623-1720. To be acceptable for the entering class of fall 1995, the new MCAT must be taken no later than fall 1994. No scores before 1991 will be accepted.

Applicants must also meet the following academic requirements:

A. Must have completed at least three years of study in an accredited college or university in the United States or Canada. A minimum of 90 semester hours or 135 quarter units of college-level work is required. Courses in highly specialized fields are acceptable only at the discretion of the medical school.

B. Must have completed satisfactorily before matriculation each of the following courses:

	Quarter Units	Semester Units
1. English, 1 year or its equivalent.	12	6
2. Biological science, 1 year including laboratory, or its equivalent.	12	8
3. General chemistry, 1 year including laboratory, or its equivalent.	12	8
4. Organic chemistry, 1 year or its equivalent. If two or more undergraduate organic chemistry courses are offered, it is recommended that you elect the more rigorous option.	12	8
5. Physics, 1 year or its equivalent.	12	8
6. Mathematics, coursework sufficient to satisfy prerequisites for integral calculus. (Coursework through integral calculus is recommended).	6	4

(You will find helpful experience and knowledge gained in biochemistry, genetics, and embryology.)

C. Must demonstrate the potential to perform academically at least as well as the average of the current first year class. This reflects the School of Medicine's generally higher standards and our emphasis on potential as judged from the application as a whole, including but not limited to MCAT and GPA scores.

FEES

At the time of registration each quarter, every student must pay the following fees.

These are the proposed fees for the 1994-95 academic year. Because they are subject to legislative and gubernatorial action, these fees may change without notice.

School of Medicine Fees—Entering Students*

University Registration Fee**	\$239.00
Memorial Union Fee	28.50
Disability Insurance Fee [§]	61.00
Health Insurance Fee [†]	142.50
Educational Fee [‡]	1,121.00
Professional School Fee	792.00
Total for California residents	\$2,384.00

Tuition for nonresidents	2,566.00
Total for nonresidents	\$4,950.00

School of Medicine Fees—Continuing Students*

University Registration Fee	\$239.00
Memorial Union Fee	28.50
Disability Insurance Fee [§]	61.00
Health Insurance Fee [†]	142.50
Educational Fee [‡]	1,121.00
Professional School Fee	126.00
Total for California residents	\$1,718.00

Tuition for nonresidents	2,566.00
Total for nonresidents	\$4,284.00

*Continuing students are those who were enrolled spring quarter 1994. PELP students are considered continuing students. Entering students are those who were not previously enrolled in the School of Medicine. Students who withdraw and later apply and are accepted as re-admitted students are considered new (entering) students.

** University Registration Fee = \$237.00 in winter and spring quarters.

† Students must purchase the Graduate Student Health Plan unless they are able to prove comparable coverage under another plan.

‡ Educational Fee = \$1120.00 in winter and spring quarters.

§ An annual fee of \$61.00 will be assessed fall quarter—applies to medical students only; does not apply to interns and residents or health science academics.

APPLYING FOR ADMISSION

November 1 Deadline for filing applications for admission for 1995-96 to the School of Medicine

The School of Medicine participates in the centralized American Medical College Application Service (AMCAS). Application request cards are available from the Admissions Office, School of Medicine, University of California, Davis, CA 95616, after April 1 of each year. You may also secure this form from other AMCAS-participating medical schools or from your premedical adviser. You need to submit only one application and one set of official transcripts to AMCAS, regardless of the number of member schools to which you are applying.

Upon receipt of the application request form, AMCAS will send you an application for admission, together with descriptive material and instructions. Submit the

completed application and other required credentials directly to AMCAS for verification, reproduction, and immediate distribution to the medical schools you have indicated.

After your AMCAS application has been received by the School of Medicine, the Admissions Office will notify you and may request a secondary application, and two letters of recommendation along with a nonrefundable application fee of \$40. Send these items directly to the Chairperson of the Admissions Committee, School of Medicine, University of California, Davis, CA 95616, and not to AMCAS. Recommendations can be in the form of a report by a premedical advisory committee at the college or university where you are enrolled or letters from two faculty members who are familiar enough with you and your abilities to make a meaningful evaluation. We recommend that one letter be from a science instructor and the other from a non-science instructor.

Applications are accepted by AMCAS between *June 15* and *November 1*. We strongly recommend that you make an early request for application materials from AMCAS and see that the necessary supporting items reach the Committee as soon as possible after the School of Medicine requests them. The Committee reviews only complete application files and schedules interviews for highly qualified applicants throughout the application period and beyond.

A personal interview is usually required before a place in the first-year class can be offered. However, because of the large number of applicants, it is not possible to interview each one, and for this reason interviews are held only at the invitation of the Admissions Committee. Interviews take place at the medical school in order to provide you with first-hand knowledge of programs and facilities and give you the opportunity to meet some of the students.

As decisions are made, letters of acceptance are sent; this can be as early as mid-October and as late as September of the following year.

Applicant Selection. The class entering in the fall will be limited to 93 students selected on the basis of academic achievement, academic promise, and personal characteristics. The Admissions Committee uses these criteria to determine if a candidate will be able to complete satisfactorily the requirements of the medical curriculum and become excellent medical practitioners. Factors taken into consideration include scholastic records, Medical College Admission Test performance, and reports of teachers, advisers, and interviewers with regard to intellectual capacity, motivation, emotional stability, and personal dedication.

The majority of openings in the entering class will be awarded to students who are California residents. However, the School of Medicine participates in the program of the Western Interstate Commission for Higher Education (WICHE) and residents of participating states will be considered as residents for purposes of admission. For more information, write the WICHE at Post Office Drawer P, Boulder, CO 80302.

The School of Medicine selects students for admission with a view to meeting the needs of society, of the medical profession, and of the School. Because we live in a pluralistic society, and the educational experience is enhanced by the interaction of students from various backgrounds, the School desires diversity in its student body. This is reflected in the School's commitment to expand opportunities in medical education for individuals from groups underrepresented in medicine as the result of societal discrimination and to increase the number of physicians practicing in underserved areas. Therefore, the Admissions Committee, which is composed of individuals from a variety of cultural backgrounds and which is representative of a broad spectrum of medical sciences, evaluates applicants in terms of all relevant factors. These include academic credentials, with due regard to how they may have been affected by disadvantages experienced by the applicant, such personal traits as character and motivation, experience in the health sciences and/or the



community, career objectives, and the ability of the individual to make a positive contribution to society, the profession, and the School.

Transfer with Advanced Standing

Currently enrolled students in good standing at approved medical schools in the United States or Canada may apply for admission to the third year of study. In order to provide the best facilities and clinical resources, however, we must limit the number of students in our clinical clerkships. Therefore, applications for transfer to the third year are considered on a space-available basis.

Deadline for application is April 1 of the year of transfer. A nonrefundable application fee of \$40.00 is required. Applicants must provide medical school transcripts, and if accepted, must pass Part I of the USMLE at their current institution. Available spaces may be filled by the Admissions Committee based upon the entire content of an application, or they may request additional information including letters of recommendation and a personal interview. All applicants for transfer must meet the usual requirements for admission, as well as satisfactorily completing the equivalent of two years of study at the medical school. Applicants will be notified of the Admissions Committee's decision starting April 30.

PROGRAM OF STUDY

The curriculum for the M.D. degree is normally a four-year program that provides comprehensive training for the practice of medicine. The curriculum has been designed to provide a blend of basic sciences training and clinical experience. Although the emphasis during the first two years is on the basic-science foundations of medicine, medical students are introduced to patient care during their very first quarter of study, reflecting the school's commitment to the training of highly skilled clinicians. Several volunteer clinics, largely staffed by UCD medical students, provide an ideal setting for hands-on clinical experience.

In addition to the Doctor of Medicine degree, the School of Medicine at Davis offers a combined M.D./Ph.D. program whose target is to train physicians to meet, respond to, and solve the broad diversity of problems and dilemmas facing current and future health care. Meeting this challenge requires those capable of advancing our biological sciences knowledge base, and others who can recognize and solve the ethical, political and humanitarian issues that confront the broad delivery of health care to all. Hence, the field for the Ph.D. in the joint degree program at UC Davis can be any graduate program offered on the Davis campus, extending beyond the traditional biological sciences boundaries, and strongly encouraging candidates to seek degrees in social sciences and humanities. All requirements for both degrees are met in a course of study that usually lasts six years. To be admitted, and be concurrently enrolled in both degree programs, students are required to apply for separate admission to both the M.D. and Ph.D. programs, and also obtain permission of the School of Medicine M.D./Ph.D. Advisory Committee. Inquiries about admission to graduate education should be directed to the Dean of Graduate Studies, University of California,

Davis, CA 95616. For more information concerning the M.D./Ph.D. program, contact Ms. Suzanne Mink, Office of Curricular Support, Room 2431, MS 1A, School of Medicine, University of California, Davis, CA 95616.

SCHOOL OF MEDICINE

Academic Calendar 1994-95

The School of Medicine operates on a different schedule from the rest of the campus. A more detailed academic calendar may be obtained from the Office of Curricular Support, 2431 Medical Sciences 1A, University of California, Davis 95616.

SUMMER QUARTER 1994

Instruction begins for 2nd-year students (electives)	Mon, June 27
Instruction begins for 3rd- and 4th-year students	Tues, July 5
Instruction begins for 2nd-year (regular curriculum)	Mon, July 25
Instruction ends for 2nd-year students	Fri, Sept 2
Final exams for 2nd-year students	Sept 6-9
Instruction ends for 3rd- and 4th-year students	Fri, Sept 23
Academic and administrative holidays	Mon, July 4 Mon, Sept 5

FALL QUARTER 1994

Instruction begins for 3rd- and 4th-year students	Mon, Sept 26
Instruction begins for 1st- and 2nd-year students	Thurs, Sept 22
Exam and study period for 1st-year students	Oct 31-Nov 4
Exam and study period for 2nd-year students	Oct 28-Nov 4
Instruction ends for 1st-year and 2nd-year students	Fri, Dec 2
Final exams for 1st-year and 2nd-year students	Dec 5-9
Instruction ends for 3rd- and 4th-year students	Fri, Dec 16
Academic and administrative holidays	Nov 24-25 Dec 23-26 Dec 30, Jan 2

WINTER QUARTER 1995

Instruction begins for 1st-, 2nd-, 3rd-, and 4th-year students	Tues, Jan 3
Exam and study period for 1st- and 2nd-year students	Feb 6-10
Instruction ends for 1st-year students	Fri, Mar 10
Instruction ends for 2nd-year students	Fri, Mar 17
Final exams for 1st-year students	Mar 13-17
Final exams for 2nd-year students	Mar 20-24
Instruction ends for 3rd- and 4th-year students	Fri, Mar 24
Academic and administrative holidays	Mon, Jan 16 Mon, Feb 20

SPRING QUARTER 1995

Instruction begins for 1st-, 3rd-, and 4th-year students	Tues, Mar 28
Instruction begins for 2nd-year students	Wed, Mar 29
Exam and study period for 1st-year students	April 24-28
Instruction ends for 2nd-year students	Fri, May 8
Final exams for 2nd-year students	May 10-17
Instruction ends for 1st-year students	Fri, June 2
Instruction ends for 4th-year students	Thurs, June 8
Final exams for 1st-year students	June 5-9
Instruction ends for 3rd-year students	Fri, June 16
Academic and administrative holidays	Mon, Mar 27 Mon, May 29

SCHOOL OF VETERINARY MEDICINE



The mission of the School of Veterinary Medicine is to provide the best possible health care for animals through teaching, research, and public service. Students are offered a rigorous four-year program of study that prepares them for diverse career opportunities in veterinary medicine.

PREPARATION FOR THE STUDY OF VETERINARY MEDICINE

To be considered for admission to the School, you must have completed 108 quarter units (72 semester units) in an accredited college or university and have completed the following courses:

Lower Division Required Sciences	Quarter Units
General Chemistry	15
Organic Chemistry	6
Physics	6
Biological Sciences	10
Upper Division Required Sciences	
Embryology	4
Genetics	4
Biochemistry	3
Physiology	5
Required English	12
Required Humanities and Social Sciences	12
Required Statistics	4

(To convert semester units to quarter units, multiply by $\frac{2}{3}$. For example, a 4-unit semester course is equivalent to a 6-unit course in the quarter system.)

You should plan your preveterinary medical education carefully. The required courses should be spaced to permit maximum scholastic achievement. An undergraduate major should be selected on the basis of individual interest and aptitude; there is no advantage gained toward admission by selecting one major over another. Many students planning to enter veterinary school have definite areas of interest within the general field of veterinary medicine. These individuals are encouraged to take courses (for example, computer science, agricultural economics, molecular and biochemical genetics) that will broaden their background in these areas. Some specialized areas include laboratory animal medicine, exotic animal medicine, public health, food animal practice, and biomedical research.

Examinations. All applicants must take the General Aptitude Test and the Subject Test in Biology of the Graduate Record Examination (GRE) by the October test date. GRADUATE RECORD EXAMINATION SCORES RECEIVED FROM THE NOVEMBER TEST OR LATER TESTS FOR THE YEAR THE APPLICATION IS FILED WILL NOT BE ACCEPTED FOR CONSIDERATION. Applications for the exams and additional information may be obtained from the Educational Testing Service, Box 23470, Oakland, CA 94623-0470. The GRE must be taken within five years of the time you submit your application. The highest scores will be used when the GRE is taken more than once.

Grade Point Average. To be considered for admission, you must have a minimum grade point average of 2.50 for both the required sciences and the cumulative grade point average. Applicants who do not meet the minimum grade point average can qualify for admission by receiving GRE scores in the upper 30th percentile for the combined General Aptitude Test and Subject Test in Biology. Applicants who do not have transcripts with letter grading can qualify for consideration with these same scores or by receiving a bachelor's degree with honors.

Practical Experience. Admission to the School requires extensive experience with animals. This experience should entail more than having family pets and should include experience with several animal species if it includes relevant experience with types of activities that give an applicant an appreciation and understanding of the veterinary profession. The minimum requirement for animal, veterinary and biomedical science experience is 180 hours (4.5 weeks). This experience should also include working with veterinarians, so that the applicant understands the duties and responsibilities of a practitioner and the breadth of veterinary medicine.

FEES

At the time of registration each quarter, every student must pay the following fees.

These are the proposed fees for the 1994-95 academic year. Because they are subject to legislative and gubernatorial action, these fees may change without notice.

School of Veterinary Medicine Fees— Entering Students*

University Registration Fee**	\$239.00
Memorial Union Fee	28.50
Health Insurance Fee†	142.50
Educational Fee‡	1,121.00
Professional School Fee§	668.00
Total for California residents	\$2,199.00

Tuition for nonresidents	2,566.00
Total for nonresidents	\$4,765.00

School of Veterinary Medicine Fees— Continuing Students*

University Registration Fee**	\$239.00
Memorial Union Fee	28.50
Health Insurance Fee†	142.50
Educational Fee‡	1,121.00
Total for California residents	\$1,531.00

Tuition for nonresidents	2,566.00
Total for nonresidents	\$4,097.00

* *Continuing students* are those who were enrolled spring quarter 1994. *PELP students* are considered continuing students. *Entering students* are those who were not previously enrolled in the School of Veterinary Medicine. Students who withdraw and later apply and are accepted as re-admitted students are considered new (entering) students.

** University Registration Fee = \$237.00 in winter and spring quarters.

† Students must purchase the Graduate Student Health Plan unless they are able to prove comparable coverage under another plan.

‡ Educational Fee = \$1,120.00 in winter and spring quarters.

§ Professional School Fee = \$666.00 in winter and spring quarters.

APPLYING FOR ADMISSION

November 1 Deadline for filing applications for admission for 1995-96 to the School of Veterinary Medicine

Students are admitted to the School of Veterinary Medicine in the fall only. Applications may be obtained any time after July 15 by writing to the Office of the Associate Dean—Student Programs, School of Veterinary Medicine, University of California, Davis, CA 95616-8731 or by calling 916-752-1383. Applications, accompanied by a nonrefundable application fee of \$40 must be received by this office no later than *November 1*.

Students interested in admission to the School of Veterinary Medicine are urged to request an *Announcement of the School of Veterinary Medicine* at an early date so that all minimum academic requirements and deadlines are met.

Applicants with disadvantaged backgrounds (cultural, economic, social, educational, disabled, and other factors) are encouraged to apply to the Veterinary Medical Opportunity Program (VMOP). For further information and advising services, contact the Director of Student Affirmative Action by writing to the Office of the Associate Dean—Student Programs or by calling 916-752-1383.

Letters of Evaluation. Three letters of evaluation are required in addition to your application and should be requested from persons who know you well, understand academic and professional demands, and have had the opportunity to evaluate your personal qualities and potential as a professional person. The evaluator should be willing to write a thorough, comprehensive letter on your behalf.

Interviews. Interviews may be requested, as deemed necessary, by the Dean and Admission Committee to obtain additional information. The Dean and Admission Committee may require additional evaluation procedures for selecting candidates for admission.

Out-of-State and Foreign Applicants. California residents are given priority for admission to the school. A small number of uniquely qualified applicants who are not California residents may be admitted as nonresidents. Residents of states participating in the Western Interstate Commission for Higher Education (WICHE) will be considered as residents for purposes of admission. Based on agreements with WICHE, a small number of applicants from WICHE states may be admitted with WICHE financial support. Other applicants from WICHE states may be admitted but only as nonresidents. For information related to the WICHE program, write to the Western Interstate Commission for Higher Education, Post Office Drawer P, Boulder, CO 80302. The criteria for determining residency are explained in Residence for Tuition Information in the Appendix of this catalog. Specific questions should be addressed to the Legal Analyst—Residence Matters, 300 Lakeside Dr., 7th Floor, Oakland, CA 94720. No other persons are qualified to give rulings on residency.

If you attended college out-of-state, you must include course descriptions of all required science courses with your application. You can do this by sending the current college catalog or by copying the relevant pages.

If you are from a country other than the United States, you must include a certified English version of your college transcript, and, if English is your second language, the official scores from the Test of English as a Foreign Language (TOEFL) taken within five years of the date when your application is submitted.

Criteria for Selection

I. Academic Factors (50-60%)

A. College coursework:

1. GPA of all undergraduate and graduate coursework
2. GPA of required science coursework
3. GPA of last two years of undergraduate work (minimum of 72 quarter units)

B. Graduate Record Examination:

1. General Aptitude Test (Verbal, Quantitative and Analytical)
2. Subject Test in Biology

II. Non-Academic Factors (40-50%)

A. Narrative (5-20%)

B. Letters of Evaluation (5-20%)

C. Interviews (0-20%)

Applicants will also be evaluated for their understanding of the profession and the responsibilities of being a veterinarian, interest in serving the public, maturity, motivation, and other qualities necessary for successful academic and professional work.

PROGRAM OF STUDY

Doctor of Veterinary Medicine. To receive a Doctor of Veterinary Medicine degree, students must study veterinary medicine for the equivalent of 12 quarters of 12 weeks each (the last six quarters must have been spent in the School of Veterinary Medicine, University of California, Davis). A grade point average of 2.0 (C), computed on all courses taken in the School, is required and students must satisfactorily complete all required work as determined by the faculty of the School.

Master of Preventive Veterinary Medicine. Applicants for candidacy to the Master of Preventive Veterinary Medicine (M.P.V.M.) degree program must have completed the Doctorate in Veterinary Medicine or the equivalent; final admission decisions rest with the Admissions Committee, MPVM program. For advising purposes, an option should be selected from the seven listed below at the time of application. Application deadlines for fall quarter admission are as follows: International students—March 1; Domestic students—May 1. (Please note that the deadline for applications for Non-Resident Tuition Fee Fellowships is January 15.) International applicants are encouraged to apply as early as possible. Students wishing to enter winter or spring quarter should contact the MPVM Program Director concerning application deadlines. Application forms can be requested from the Director, MPVM Program, School of Veterinary Medicine, University of California, Davis, CA 95616.

Candidates for the MPVM degree must satisfactorily complete a total of 50 units of coursework while in residence. This includes 31 units of required courses and 19 units of approved electives which include up to 10 units of research in a field appropriate to the chosen option. One requirement of the MPVM program is to complete a research study which culminates in a written report and oral presentation. A committee, consisting of three faculty members, reviews each paper for acceptability and assigns an appropriate grade.

The degree program extends over a minimum of twelve months to a maximum of two years. Students who intend to complete the program in one calendar year must register in August unless they have recently completed and performed satisfactorily in a statistics course that has been approved by the MPVM Director and the instructor of the "Orientation to Statistics" course at the time of the student's acceptance into the program. Students meeting this requirement may register at the beginning of the fall quarter in late September. Students who intend to remain in the program for more than one year may register in the optimal course sequencing, but arrival in August is recommended.

Seven options offered under the MPVM Program permit students to select an area of study that best identifies their individual interests and needs. The options and advisers are as follows:

1. *Epidemiology and Herd Health*: study of quantitative methods used in the design and analysis of epidemiologic, economic, herd health, and production studies

Advisers: I. A. Gardner, P. H. Kass

2. *Veterinary Public Health*: study and control of zoonotic diseases

Adviser: B. Chomel

3. *Food Safety*: study of food safety and products of animal origin processing and technology

Adviser: H. Riemann

4. *Laboratory Science*: design and execution of a laboratory or a laboratory/field-based project relevant to animal health

Adviser: K. M. Lam

5. *Environmental Health*: study of the distribution of environmental determinants and their effects on health outcomes in populations

Adviser: P. H. Kass

6. *Wildlife Health*: study of quantitative methods, health and disease surveillance, interactions between wildlife, humans, and their environments, and the conservation of wildlife species

Advisers: W. M. Boyce, T. E. Carpenter

7. *Veterinary Programs Administration*: administration of programs for control of animal diseases, veterinary laboratories, research, or educational veterinary service. (As the intent of this option is to permit veterinarians to spend a mid-career sabbatical leave for leadership training, enrollment is limited to individuals with demonstrated record of success in some area of veterinary medicine.)

Adviser: R. H. McCapes

Inquiries regarding the program should be directed to the Director, MPVM Program, School of Veterinary Medicine, University of California, Davis, CA 95616.

Combined Program. Students may enroll in the combined DVM/MPVM program in which the M.P.V.M. degree may be awarded by the end of the fall quarter of the fifth year or as soon thereafter as all requirements for both the D.V.M. and M.P.V.M. degrees are completed. The advantage of the combined program resides in the ability of the student to complete the MPVM program within six months after normal completion time of the D.V.M. degree, rather than 15 months, as would be the case if taken sequentially.

Master of Science and Doctor of Philosophy. General information regarding these degrees will be found in the *Announcement of Graduate Studies*, which may be obtained from Graduate Studies, University of California, Davis, CA 95616. Additional detailed information may be obtained by writing the chairperson of the department in which you wish to study.

SCHOOL OF VETERINARY MEDICINE

Academic Calendar 1994-95

FALL QUARTER

Orientation for 1st-year students	Thur-Fri, Sept 15-16
Instruction begins for 4th-year students	Tues, Sept 6
Instruction begins for 1st-, 2nd-, and 3rd-year students	Mon, Sept 19
Schalm Lecture	To be announced
Thanksgiving Holiday	Thur-Fri, Nov 24-25
Instruction ends	Fri, Dec 9
Finals end	Fri, Dec 16

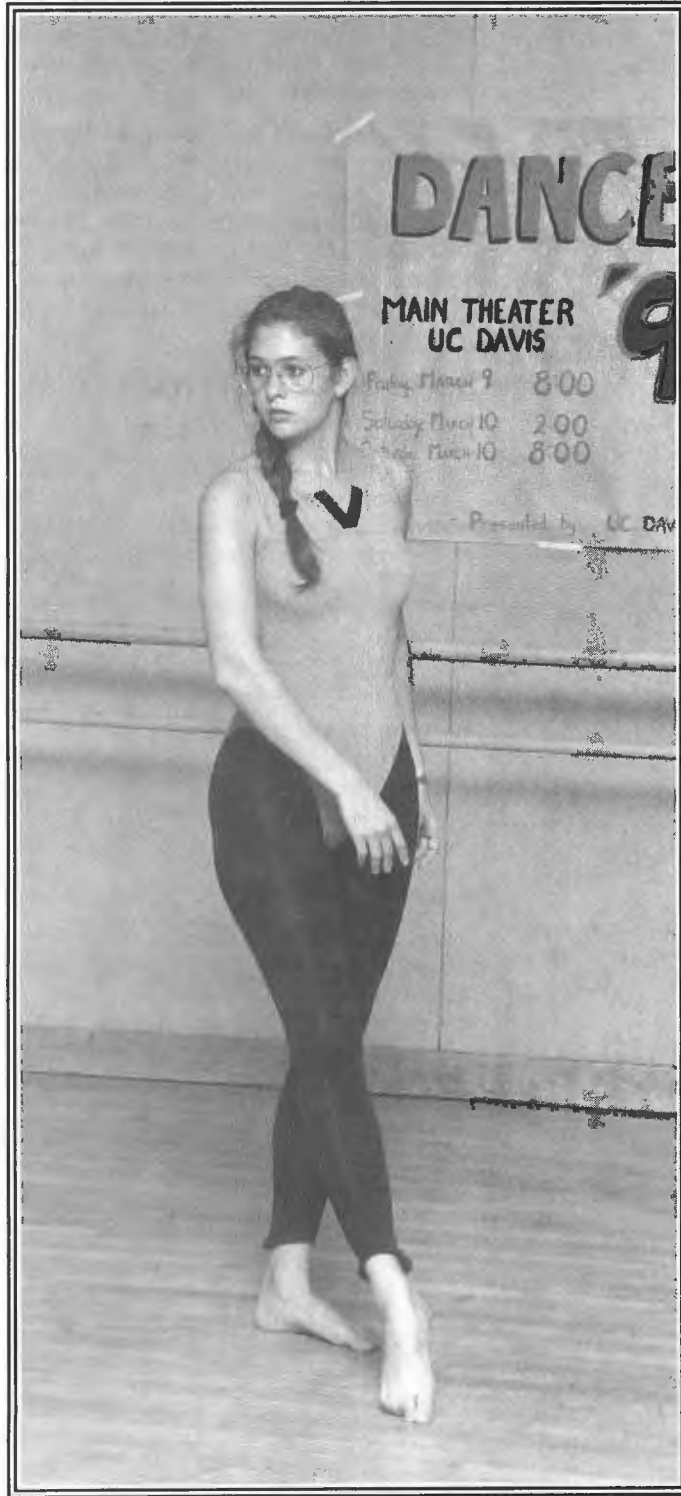
WINTER QUARTER

Instruction begins	Tues, Jan 3
M. L. King Holiday	Mon, Jan 16
President's Holiday	Mon, Feb 20
Research Day	To be announced
Instruction ends	Fri, Mar 17
Finals end	Fri, Mar 24

SPRING QUARTER

Instruction begins	Mon, April 3
Memorial Day Holiday	Mon, May 29
Instruction ends	Fri, June 9
Finals end	Fri, June 16
Commencement	Sat, June 10

PROGRAMS AND COURSES



COURSE DESIGNATIONS

Here is a sample of how a course is listed in this catalog.

190. Proseminar in Nutrition (1) I, II, III. The Staff Seminar—1 hour. Prerequisite: senior standing; course 111. Discussion of human nutrition problems. Each term will involve a different emphasis among experimental, clinical, and dietetic problems of community, national, and international scope. May be repeated for credit with consent of instructor. (P/NP grading only.)

Top line: course number; title; units; quarters offered; instructor(s).

Paragraph following: course instructional format; prerequisite; course description; grading if other than letter grading.

Quarters offered: the quarter in which a course is intended to be given is shown as follows:

- I. Fall Quarter (September to December) *or*
Fall Semester (August to December), School of Law
- II. Winter Quarter (January to March) *or*
Spring Semester (January to May), School of Law
- III. Spring Quarter (April to June)
- IV. Summer Quarter (July to September) for students
in the School of Medicine only

Alternate Year Designation

Some course descriptions will include the phrase "Offered in alternate years." If the course number is marked with an asterisk (*), this indicates that the course *will not* be offered this academic year, but will be offered the following year. If the course number is not marked with an asterisk, this indicates that the course *will* be offered this academic year, but will not be offered the following year.

Multi-Quarter Courses

A series of course numbers followed by two or three letters (for example, Animal Science 49A-49B-49C) is continued through three successive quarters, ordinarily from September to June. The first quarter course listed this way is a prerequisite to the second, and the second to the third. On the other hand, where A and B portions of a course are listed separately (for example, Economics 160A and 160B), the A course is *not* a prerequisite to B, unless it is specifically mentioned in the list of prerequisites.

Expanded Course Descriptions

You may find that, because of space limitations, the descriptions in the *General Catalog* will not include all the information you would like about a course. The faculty has responded to this need by writing the "Expanded Course Descriptions," giving more detailed explanations about each course offering. These descriptions are available each quarter to assist students in selecting their courses. They contain such information as course goals, texts used, preparation required of students, basis for grading, course format, special assignments (papers, field trips, etc.), and a topical outline of the material to be covered.

Copies of the "Expanded Course Descriptions" are available for on-campus use at the Shields Library Reference and Periodicals desks, the College deans'

offices, advisers' offices, advising centers, departmental offices, The First Resort, and in the dormitories at the head residents' offices.

The course offerings and instructors listed in this catalog are subject to change without notice. For more current quarter offerings and instructors, refer to the *Class Schedule and Room Directory*, available in the UCD Bookstore.



African American and African Studies

(College of Letters and Science)

John Stewart, Ph.D., Director

Program Office, 280 Kerr Hall (916-752-1548)

Committee in Charge

Desmond Jolly, Ph.D. (*Agricultural Economics*)

Carl C. Jorgensen, Ph.D. (*Sociology*)

Jacob Olupona, Ph.D. (*African American and African Studies*)

Mark A. Reid, Ph.D., (*African American and African Studies*)

John H. Stanfield, II, Ph.D., (*African American and African Studies*)

John Stewart, Ph.D., (*African American and African Studies*)

Patricia Turner, Ph.D. (*African American and African Studies*)

Clarence E. Walker, Ph.D. (*History*)

David Scofield Wilson, Ph.D. (*American Studies*)

Faculty

Michele Foster, Ph.D., Associate Professor

Jacob Olupona, Ph.D., Associate Professor

Mark A. Reid, Ph.D., Associate Professor

John H. Stanfield, II, Ph.D., Professor

John Stewart, Ph.D., Professor

Patricia Turner, Ph.D., Associate Professor

The Major Program

The African American and African Studies Program provides courses through which students learn about the history and culture of African Americans. The program is committed to providing students with a multi-disciplinary learning experience. Majors are required to take selected courses in other programs and departments that complement those offered within African American Studies. Majors and minors are also encouraged to take advantage of internship programs.

The Program. Students are encouraged to combine an examination of African American history and culture in the U.S.A. with African or diaspora studies. The emphasis in African American (U.S.A.) culture includes courses on the history, culture, arts, literature of African Americans, the patterns of their socio-political and cultural movements, and the struggle with racism as a social and psychological problem. The emphasis in African Studies includes courses on the social organization, culture, and religion of West African societies. The diaspora emphasis includes courses on the African heritage in The Americas, Islam in Africa and The Americas, African religion in the diaspora and cinema studies. In addition, students may choose to do special research projects.

Career Alternatives. African American and African Studies majors are well prepared for employment opportunities in the Office of Education, human service units, county social service programs, and counseling services. African American and African Studies is also an appropriate background for work in community organizations like the Urban League, NAACP, Urban Affairs, and Office of Economic Opportunity. The major also provides a strong background for future study in graduate school.

African American and African Studies (Afro-American Studies)

A.B. Major Requirements:

UNITS

Preparatory Subject Matter	36
African American Studies 10.....	4
Two courses from Anthropology 2; Economics 1A, 1B; Geography 2; Sociology 1; Political Science 1, 2; Psychology 1.....	8

Two courses from Chicano Studies 10; Native American Studies 1, 10; American Studies 45; Asian American Studies 1, 2.....8
History 27A, 27B.....8
Music 28.....4
One course from Statistics 13, Sociology 46A, or Psychology 41.....4

Depth Subject Matter

A coordinated program of upper division courses, selected and approved in consultation with the major advisers to include:

Core courses: African American Studies 101, 110, 120.....12
Additional upper division units chosen to reflect the student's major emphasis.....24

Total Units for the Major

Major Program Emphasis

The following areas of emphasis are offered as a guideline for students interested in majoring in African American Studies:

Culture of African American emphasis:

African American Studies 107, 120, 121;
Anthropology 140A, 140B; History 177A, 177B; Political Science 167.

African emphasis:

African American Studies 107, 120, 121;
Anthropology 140A, 140B; History 115A, 116; Political Science 134, 146.

The above areas of emphasis are not the only areas students may choose for the African American and African Studies major. However, it should be noted that the major program must (a) be developed in consultation with an African American and African Studies faculty member, and (b) be approved by the Program's Major adviser. Information regarding the areas of emphasis may be obtained from the African American and African Studies Office.

Related Upper Division Courses

Student who contemplate majoring in African American and African Studies are advised that the following courses are offered by faculty members in other disciplines and focus on African and African American people and their culture.

Anthropology 104, 139A, 139B, 140, 153;
Applied Behavioral Sciences 151, 152, 153, 159A, 159B, 172; Art History 150;
Dramatic Art 155; Education 150; English 179, 181; Geology 125A, 125B; History 102, 115A, 115B, 115C, 116, 177; Music 113B; Political Science 134, 138, 146, 151, 167, 176; Sociology 129, 130.

Major Adviser. Patricia Turner.

Minor Program Requirements:

UNITS

African American and African Studies	24
Select one course from African American Studies 10, 15, or 80.....	4
Select five courses from African American Studies 100, 101, 107, 110, 120, 121, 123, 133, 145A, 145B, 151, 152, 153, 160, 162.....	20

American History and Institutions. This University requirement can be satisfied by completion of African American Studies 10, 100, 120, 121. (See also under University requirements.)

Courses in African American and African Studies (AAS)

Lower Division Courses

10. Introduction to Afro-American Culture and Society (4) I. Turner

Lecture—4 hours. Introduction to the contemporary Black American experience by critically examining historical, political and social and economic factors that have affected the development and status of Afro-American people.

12. Introduction to African Studies (4) II. Olupona
Lecture/discussion—4 hours. Introduction to African Studies which will focus on the various disciplinary perspectives through which African society and culture are generally studied. A survey of methods, resources and conceptual tools for the study of Africa.

15. Introduction to Afro-American Humanities (4) III. Reid

Lecture—4 hours. Introduction to Afro-American cultural tradition as it evolved from West Africa to the Caribbean, South America and North America via slavery.

50. Black Images in Popular Culture (4) III. Turner, Reid

Lecture—2 hours; discussion—2 hours. A survey of the depictions of Blacks in popular culture (popular press, stage, radio, film, television, advertising) from the middle of the sixteenth century to the present.

51. History of Afro-American Dance (4) III. Wynn-Bolden

Lecture—2 hours; discussion—2 hours. Evolution of African American dance, tracing its history and development from West Africa through the Caribbean and to the United States. Investigates the social relevance of African American dance and the artistic merits and contributions of African American choreographers and performers.

52. African Traditional Religion (4) II. Olupona

Lecture—2 hours; discussion—2 hours. Introduction to the traditional religions of the sub-Saharan African peoples: emphasis on myths, rituals and symbols in West, East, Central and South African indigenous religions. Examines themes such as sacred kingship, divination system, women, prophecy, conversion and adaptation to Islam and Christianity.

80. Introduction to Black Politics (4) III. Stanfield
Lecture—4 hours. Introduction to the analysis of Afro-American politics, using conceptual frameworks from political science and other social sciences.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Survey of Ethnicity in the U.S. (4) II. Turner
Lecture—4 hours. The history, culture, philosophy, and current problems of groups considered ethnic minorities in the United States as viewed by the groups themselves. General Education credit: Contemporary Societies.

101. Introduction to Research in the Afro-American Community (4) III. The Staff

Lecture—4 hours. Prerequisite: course 10 or consent of instructor. Introductory survey of Afro-American Studies methods and techniques; problems and methodology in Afro-American Studies.

107. African Cultural Heritage in the Americas (4) III. Stewart

Lecture—4 hours. Prerequisite: course 110 or consent of instructor. Analysis of African cultural systems as they adapted to the slave regimes in the antebellum and their retentive mechanisms in the postbellum Americas.

110. West African Social Organization (4) II. Olupona

Lecture—4 hours. Prerequisite: course 101 or consent of instructor. Ecology, population, social organization, and survival culture of West Africa in the pre-colonial, colonial, and post-colonial periods.

*120. Afro-America: Pre-Emancipation (4) II. The Staff

Lecture—4 hours. Prerequisite: course 10 or consent of instructor. Ecology, social organization, and survival culture of Afro-America. Historical and comparative study of Afro-American populations in relation to other groups.

***121. Afro-America: Post-Emancipation** (4) II. The Staff
Lecture—4 hours. Prerequisite: course 10 or 120, or consent of instructor. Analysis of contemporary Afro-American cultural adaptations and social organizations within the United States.

123. The Black Female Experience in Contemporary Society (4) III. The Staff
Lecture—4 hours. Prerequisite: upper division standing or consent of instructor. Black female social, intellectual, and psychological development. Black women's contributions in history, literature, and social science; life experiences of Black women and philosophical underpinnings of the feminist movement.

133. The Black Family in America (4) III. The Staff
Lecture—4 hours. Prerequisite: upper division standing or consent of instructor. Analysis of social science research to examine relationship between Black family structures, patterns of functioning, and political, economic, and social conditions. Examination of role differentiation within families by race and social class. General Education credit: Contemporary Societies.

140. Education in the African American Community (4) I. Foster
Lecture—2 hours; discussion—1 hour; fieldwork—3 hours. Prerequisite: course 10 or 100, and completion of the Subject A requirement. Examination of the history of the education of African Americans in the United States. Examination and critique of contemporary theories concerning the schooling of African Americans.

145A. Black Social and Political Thought (4) III. Stanfield
Lecture—4 hours. Prerequisite: course 10 or 80, or consent of instructor. Exploration and analysis of Black social and political thought in the Americas.

***145B. Black Intellectuals** (4) III. Stanfield
Lecture—4 hours. Prerequisite: course 10, 80, 145A, or consent of instructor. Exposition and critical analysis of selected theoretical writings of Black intellectuals, and especially political and social thinkers, in the Americas.

***150A. The Afro-American Visual Arts Tradition: A Historical and Cultural Study** (4) I. The Staff
Lecture—4 hours. Prerequisite: upper division standing. Afro-American visual arts tradition, folk and formal, in historical and cultural context, from 1600 through Reconstruction.

***150B. The Afro-American Visual Arts Tradition: A Historical and Cultural Study** (4) II. The Staff
Lecture—4 hours. Prerequisite: upper division standing. Afro-American visual arts tradition, folk and formal, in historical and cultural context, from Reconstruction to present.

151. Afro-American Vernacular Music and Verbal Arts (4) III. The Staff
Lecture—2 hours; discussion—2 hours. Socio-political dimensions of Afro-American musical forms like spiritual, work song, minstrelsy blues, rhythm and blues, jazz, gospel, soul and contemporary pop, and related verbal arts like preaching, toasting, rapping, etc.

152. Culture and Poetics in Black Narrative (4) I. Stewart
Lecture—3 hours; seminar—1 hour. Prerequisite: upper division standing. Recurrence of certain cultural tropes in literary texts, and their significance as the basis of a sustained poetics. Principal objectives will be the practice of critical reading, and the discovery of an approach to literature as a cultural resource.

153. African Religions in the Americas (4) I. Olupona
Lecture—2 hours; discussion—2 hours. Prerequisite: course 10 or 15. Comparative study of African religious heritage in the Americas: Jamaica, Trinidad, Cuba, U.S.A., Haiti and Brazil. Emphasis on the origins and development of Candomble, Santeria, Shango, Vodun and Rastafarianism in the New World.

160. African American Folklore (4) III. Turner
Lecture—2 hours; discussion—1 hour; fieldwork—3 hours. Prerequisite: course 10. Theory and history of African American folklore and lifelife, including music,

material culture, oral narrative, proverbs, and humor. African and Caribbean cultural influences on New World folk genres will be probed.

162. Islam in Africa and the Americas (4) III. Olupona
Lecture—3 hours; discussion—1 hour. Prerequisite: course in African American or Religious Studies, preferably course 12 or 110 or Religious Studies 60. A comparative and historical survey of Islam in the regional and cultural settings of Sub-Saharan Africa and the Americas.

197T. Tutoring in Afro-American Studies (1-5) I, II, III. The Staff (Chairperson in charge)
Tutoring—1-5 hours. Prerequisite: consent of major committee; upper division standing with major in Afro-American Studies. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. May be repeated for credit for a total of 6 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Agricultural and Environmental Chemistry (A Graduate Group)

Everett Bandman, Ph.D., Chairperson of the Group
Group Office, 109 Food Science and Technology Building (916-752-1415)

Faculty. Includes members from various departments in the Colleges of Agricultural and Environmental Sciences, Engineering, Letters and Science, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Agricultural and Environmental Chemistry offers programs of study and research leading to the M.S. and Ph.D. degrees. Study relates to the chemical and biochemical aspects of foods, wine, fibers/polymers, pesticides, and environmental pollution. Detailed information regarding graduate study may be obtained by writing the Group Chairperson.

Graduate Advisers: D.O. Adams (*Viticulture and Enology*), C.F. Shoemaker (*Food Science and Technology*), D. Hsieh and T. Shibamoto (*Environmental Toxicology*), R. J. Zasoski (*Land, Air, and Water Resources*), S.H. Zeronian (*Textiles and Clothing*).

Courses in Agricultural and Environmental Chemistry (AGC)

Graduate Courses

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Selected topics in agricultural and environmental chemistry, presented by students. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. The chemistry and biochemistry of foods, nutritional chemicals, pesticides, and other special topics as they apply to agricultural and environmental chemistry.

299. Research (1-12) I, II, III, summer. The Staff (Chairperson in charge)
Arrangements should be made well in advance with a faculty member of the Group in Agricultural and Environmental Chemistry. (S/U grading only.)

Agricultural and Managerial Economics

(College of Agricultural and Environmental Sciences)

The Major Program

The major in agricultural and managerial economics teaches students to apply economics and quantitative principles to problems in agricultural production, management, and marketing.

The Program. Each student must specialize in at least one of three options: agricultural economics, which focuses on topics related to the production and marketing of foods and fibers; consumer economics, which focuses on issues related to consumer decision making, protection, and welfare; or managerial economics, which focuses on topics related to evaluating, financing, and managing business activities.

Internships and Career Alternatives. Students in agricultural and managerial economics have opportunities to gain additional career information and preparation through internships in a variety of private business and governmental agencies. Graduates qualify for supervisory and management training positions in farm and ranch production, food and agricultural processing, agricultural sales and service, banking, finance, commodity and stock brokerages in the private sector, and a variety of agency career positions in local, state, and federal government. Students who desire additional training are well qualified to enter graduate programs in agricultural economics, economics, business administration, or law.

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
English Composition Requirement	3-12
See College requirement	0-8
Additional English (English 1, 3, 20, or 103A-G).....	3-4
Preparatory Subject Matter	65-68
Accounting (Management 11A-11B)	8
Computer Science (Agricultural Systems and Environment 21, Computer Science Engineering 10 or 30).....	3-4
Economic principles (Economics 1A-1B) ..	10
Calculus (Mathematics 16A-16B or 21A-21B).....	6-8
Statistics (Statistics 13, 103)	8
Social Science, Natural Science, Agricultural Science	40
(See undergraduate handbook in Department Advising Office for complete list of courses.)	
Breadth/General Education	6-24
<i>Note:</i> Approved General Education courses may be used to simultaneously satisfy Social, Natural, and Agricultural Science courses as defined in the Preparatory Subject Matter for the major and the campus General Education requirement.	
Depth Subject Matter †	19-21
Micro theory, Agricultural Economics 100A, 100B	8
Quantitative methods, Agricultural Economics 106, 155	8
Macro theory, Economics 101 or 105	4-5
Restricted Electives	28-32
Options (choose at least one):	
(a) Agricultural Economics.....	28
At least 15 units must be chosen from Agricultural Economics 120, 130, 131,	

*Course not offered this academic year.

132, 139, 140, 145, 150. The remaining 13 units must be selected from upper division courses in Agricultural Economics and/or Economics.

(b) Consumer Economics32
At least 15 units must be chosen from Agricultural Economics 118A, 130, 132, 141M, 142, 143, Consumer Science 100, 135. The remaining 17 units may be chosen from the aforementioned courses or from Agricultural Economics 120, Applied Behavioral Sciences 171, Economics 121A, 121B, 125, 130, Environmental Studies 160, 168A; 168B, Environmental Toxicology 101, 128, 138, Political Science 100, 174.

(c) Managerial Economics32
Agricultural Economics 18.
At least 12 units must be chosen from Agricultural Economics 112, 118A, 118B, 136, 157, 171A, 171B. The remaining 16 units may be chosen from the aforementioned courses or from Agricultural Economics 120, 130, 131, 132, 139, 140, 143, 145, 150, 156, 175, 176, Economics 121A, 121B, 151A, 151B, 160A, 160B, Political Science 174, 188.

Unrestricted Electives37-48
Total Units for the Degree180

†Students graduating with this major are required to attain at least a C average (2.0) in all upper division Agricultural Economics, Consumer Economics, and Economics courses, plus any other upper division courses taken at the University in the depth subject matter.

Advising Center for the major is located in University House Annex (916-752-6185).

Major Adviser. T.W. Hazlett (*Agricultural Economics*).

Minor Program Requirements:

The Department of Agricultural Economics offers five minor emphases open to students majoring in other disciplines who wish to complement their study programs with a minor in Agricultural and Managerial Economics. Each emphasis requires completion of Agricultural Economics 100A. Minimum prerequisites of Economics 1A-1B and Mathematics 16A-16B are required for Agricultural Economics 100A. For some courses, Statistics 13 and 103 may be required. Variable-unit courses are not accepted for any emphasis.

UNITS

Agricultural and Managerial Economics.....18

General emphasis

Agricultural Economics 100A or the equivalent4
Additional upper division courses in Agricultural Economics.....14

Agricultural Economics emphasis

Agricultural Economics 100A or the equivalent4
Additional upper division courses in Agricultural Economics.....14
Select 9 or more units from Agricultural Economics 120, 130, 131, 132, 139, 140, 145, 150.

Select additional upper division Agricultural Economics courses to complete the 18-unit total for the minor.

Consumer Economics emphasis

Agricultural Economics 100A or the equivalent4
Additional upper division courses in Agricultural Economics.....14
Select 9 or more units from Agricultural Economics 118A, 130, 132, 141M, 142, 143.

Select additional upper division Agricultural Economics courses to complete the 18-unit total for the minor.

Managerial Economics emphasis

Agricultural Economics 100A or the equivalent4
Additional upper division courses in Agricultural Economics.....14
Select 9 or more units from Agricultural Economics 112, 118A, 118B, 136, 157, 171A, 171B.

Select additional upper division Agricultural Economics courses to complete the 18-unit total for the minor.

Environmental and Natural Resource Economics emphasis

Agricultural Economics 100A or the equivalent4
Additional upper division courses in Agricultural Economics.....14
Select 9 or more units from Agricultural Economics 175 and 176, and either 100B or 120.

Select additional upper division Agricultural Economics courses to complete the 18-unit total for the minor.

Graduate Study. See the Graduate Studies section in this catalog.

Agricultural Economics

(College of Agricultural and Environmental Sciences)

Hoy F. Carman, Ph.D., Chairperson of the Department

Department Office, 118 Voorhies Hall (916-752-1517)

Student information, University House Annex:
Undergraduate, 916-752-6185
Graduate, 916-752-6886

Faculty

- Richard Alcauskas, J.D., Lecturer
- Julian M. Alston, Ph.D., Associate Professor
- Steven Blank, Ph.D., Lecturer
- Oscar R. Burt, Ph.D., Professor
- Bayford D. Butler, M.S., Lecturer
- Leslie J. Butler, Ph.D., Lecturer
- Michael R. Caputo, Ph.D., Associate Professor
- Hoy F. Carman, Ph.D., Professor
- Colin A. Carter, Ph.D., Professor
- James A. Chalfant, Ph.D., Professor
- Robert L. Cook, Ph.D., Lecturer
- Richard D. Green, Ph.D., Professor
- Arthur Havenner, Ph.D., Professor
- Thomas W. Hazlett, Ph.D., Associate Professor
- Dale M. Heien, Ph.D., Professor
- Gloria E. Helfand, Ph.D., Assistant Professor
- Garth J. Holloway, Ph.D., Assistant Professor
- Richard E. Howitt, Ph.D., Professor
- Lovell S. Jarvis, Ph.D., Professor
- Warren E. Johnston, Ph.D., Professor
- Desmond A. Jolly, Ph.D., Lecturer
- Karen Klonsky, Ph.D., Lecturer
- Douglas M. Larson, Ph.D., Assistant Professor
- Samuel H. Logan, Ph.D., Professor
- Phillip L. Martin, Ph.D., Professor
- Alexander F. McCalla, Ph.D., Professor
- Quirino Paris, Ph.D., Professor
- Refugio I. Rochin, Ph.D., Professor (*Agricultural Economics, Chicano/a Studies*)
- Richard J. Sexton, Ph.D., Professor
- Lawrence E. Shepard, Ph.D., Professor
- Joe J. Stasulat, Ph.D., Lecturer
- Daniel A. Sumner, Ph.D., Professor
- J. Edward Taylor, Ph.D., Associate Professor

Marilyn D. Whitney, Ph.D., Assistant Professor
James E. Wilen, Ph.D., Professor (*Agricultural Economics, Environmental Studies*)

Emeriti Faculty

- Harold O. Carter, Ph.D., Professor Emeritus
- Jerry Foytik, Ph.D., Professor Emeritus
- Benjamin C. French, Ph.D., Professor Emeritus
- Varden Fuller, Ph.D., Professor Emeritus
- Gordon A. King, Ph.D., Professor Emeritus
- Sylvia Lane, Ph.D., Professor Emerita
- Elmer W. Learn, Ph.D., Professor Emeritus
- Chester O. McCorkle, Jr., Ph.D., Professor Emeritus
- J. Herbert Snyder, Ph.D., Professor Emeritus
- Stephen H. Sosnick, Ph.D., Professor Emeritus

Major Program and Graduate Study. See the major in Agricultural and Managerial Economics; and for graduate study, see the Graduate Studies section in this catalog.

Major Advisers. See the *Class Schedule and Room Directory*.

Related courses. See Environmental Biology and Management 110; Environmental Studies 160, 168A, 168B, 173; and courses in Consumer Economics and Economics.

Courses in Agricultural Economics (AGE)

Lower Division Courses

***1. Economic Basis of the Agricultural Industry (4) III.**

Lecture—4 hours. Agriculture and man; the agricultural industry in U.S. and world economies; production and supply, marketing and demand; agricultural land, capital and labor markets; economic and social problems of agriculture in an urban and industrialized economy emphasizing California.

15. Population, Resources and World Agriculture (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Economic analysis of interactions among human populations, natural resources and development of world agriculture. Introduction to economic thinking about population growth, its cause and consequences for world food demand, and environmental and technological limits to increasing food supplies. General Education credit: Contemporary Societies.

18. Business Law (4) I, III, summer. The Staff
Lecture—4 hours. Prerequisite: sophomore standing. General principles of business law in the areas of contracts, business organization, real property, uniform commercial code, sales, commercial paper, employment relations, and creditor-debtor against a background of the history and functioning of our present legal system.

49A-49B-49C. Field Practice (1) I, II, III. The Staff
Discussion—1 hour; three field trips. Prerequisite: consent of instructor. Field trips and experiences to observe the various management aspects of Agricultural Production. Emphasis will be placed on developing the student's understanding and awareness of economics and management and their application in agricultural production. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in Charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100A. Intermediate Microeconomics: Theory of Production and Consumption (4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A, 1B; Mathematics 16B. Theory of individual consumer and market demand; theory of production and supply of agricultural products, with particular reference to the individual firm; pricing, output determination, and employment of resources under pure competition. (Not open for credit to stu-

*Course not offered this academic year.

dents who have completed Economics 100 or the equivalent; however, Economics 100 will not serve as prerequisite to course 100B.)

100B. Intermediate Microeconomics: Imperfect Competition, Markets and Welfare Economics (4) I, II, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A. Pricing, output determination, and employment of resources under conditions of monopoly, oligopoly, and monopolistic competition.

106. Quantitative Methods in Agricultural Economics (4) I, II, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A, Statistics 103. Statistical methods for analyzing quantitative agricultural economics data: linear and multiple correlation and regression analysis.

112. Fundamentals of Business Organization (4) I, III, summer. The Staff

Lecture—2 hours; discussion—2 hours. Prerequisite: upper division standing or consent of instructor. The role of organizational design and behavior in business and public agencies. Principles of planning, decision making; individual behavior, motivation, leadership; informal groups; conflict and change in the organization.

113. Fundamentals of Marketing Management (4) I. The Staff

Lecture—4 hours. Prerequisite: Economics 1A. For non-majors only. Nature of product marketing by the business firm. Customer-product relationships, pricing and demand; new product development and marketing strategy; promotion and advertising; product life cycles; the distribution system; manufacturing, wholesaling, retailing. Government regulation and restraints. (Not open for credit to students who have completed course 136.)

118A-118B. Tax Accounting (3-3) II-III. The Staff

Lecture—2 hours; discussion—1 hour. Prerequisite: Management 11B. Determination of the federal income tax of employees, proprietors, partners, and corporations and the tax implications of alternative business decisions and methods of accounting.

120. Agricultural Policy (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A. Analytical treatment of historical and current economic problems and governmental policies influencing American agriculture. Uses of economic theory to develop historical and conceptual understanding of the economics of agriculture; how public policy influences the nature and performance of American agriculture. General Education credit: Contemporary Societies.

130. Agricultural Markets (4) II, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A. The nature, function, organizational structure, and operation of agricultural markets; prices, costs, and margins; market information, regulation, and controls; cooperative marketing.

131. Agricultural Markets, Prices and Trade (3) II. The Staff

Lecture—3 hours. Prerequisite: course 100B; course 130 recommended. Analysis of economic interdependencies among industries, geographically dispersed markets, alternative product forms and markets separated in time.

132. Cooperative Business Enterprises (3) I. The Staff

Lecture—3 hours. Prerequisite: Economics 1A. Study of cooperative business enterprise in the United States and elsewhere; economic theories of behavior, principles of operation, finance, decision-making, and taxation.

136. Managerial Marketing (4) II. The Staff

Lecture—4 hours. Prerequisite: course 100A; Statistics 103. Application of economic theory and statistics in the study of marketing. Marketing measurement and forecasting, market planning, market segmentation, determination of optimal product market mix, sales and cost analysis, conduct of marketing research, marketing models and systems.

139. Futures and Options Markets (3) I. The Staff
Lecture—3 hours. Prerequisite: course 100A; Statistics 103. History, mechanics, and economic functions of futures and options markets; hedging; theory of inter-temporal price formation and behavior of futures and options prices; price forecasting; futures and options as policy tools.

140. Farm Management (5) III. The Staff
Lecture—5 hours. Prerequisite: Economics 1A. Farm organization and resources; economic and technological principles in decision making; analytical techniques and management control; problems in organizing and managing the farm business.

141. Consumers and the Market (4) II. The Staff
Lecture—4 hours. Prerequisite: Economics 1A. Factors affecting consumer expenditures. Structure of the market and the effects of its performance on consumers. Agencies aiding and protecting consumers, sources of information available to consumers. (Students who have had or are taking course 100A, Economics 100, or the equivalent may receive only 3 units of credit, so must enroll for course 141M.) General Education credit: Contemporary Societies.

141M. Consumers and the Market (3) II. The Staff
Lecture—4 hours. Prerequisite: Economics 1A. Factors affecting consumer expenditures. Structure of the market and the effects of its performance on consumers. Agencies aiding and protecting consumers, sources of information available to consumers. (Students who have had or are taking course 100A, Economics 100, or the equivalent must enroll for this 3-unit course instead of course 141.) General Education credit: Contemporary Societies.

142. Personal Finance (3) I, II, summer. The Staff
Lecture—3 hours. Prerequisite: Economics 1B. Management of income and expenditures by the household. Use of consumer credit, savings, and insurance by households. Principles of tax, retirement, and estate planning. (Same course as Consumer Economics 142.)

143. Investments (3) III. The Staff
Lecture—3 hours. Prerequisite: Agricultural Economics/Consumer Economics 142 or consent of instructor. Survey of investment institutions, sources of investment information, and portfolio theory. Analysis of the stock, bond and real estate markets from the perspective of the investor.

145. Farm and Rural Resources Appraisal (4) II. The Staff

Lecture—3 hours; laboratory—3 hours; field trip. Principles of farm and ranch appraisal; land utilization in relation to problems of development and valuation. Real estate instruments and elements of real estate finance.

147. Resource and Environmental Policy Analysis (3) II. The Staff

Lecture—3 hours. Prerequisite: Economics 1A; enrollment open to non-majors only. Natural resource use problems with emphasis on past and current policies and institutions affecting resource use; determinants, principles, and patterns of natural resource use; property rights; conservation; private and public resource use problems; and public issues. (Students who have had or are taking course 100A, Economics 100, or the equivalent, may receive only 2 units of credit, so must enroll in course 147M instead.)

147M. Resource and Environmental Policy Analysis (2) I. The Staff

Lecture—3 hours. Prerequisite: Economics 1A; enrollment open to non-majors only. Natural resource use problems with emphasis on past and current policies and institutions affecting resource use; determinants, principles, and patterns of natural resource use; property rights; conservation; private and public resource use problems; and public issues. (Students who have had or are taking course 100A, Economics 100, or the equivalent, must enroll in this course (for 2 units) rather than course 147.)

***148. Economic Planning for Regional and Resource Development (3)** II. The Staff

Lecture—3 hours. Prerequisite: Economics 1A and 1B; Mathematics 16A recommended. Relation of resources to economic growth, including regional

problems; planning economic development with particular emphasis on resource use in agriculture; regional and national planning by both centralized and decentralized governments.

150. Agricultural Labor (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Importance of family and hired labor in agriculture; farm labor market; unions and collective bargaining in California agriculture; simulated collective bargaining exercise; effects of unions on farm wages and earnings.

155. Quantitative Analysis for Business Decisions (4) I, II, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A; Statistics 103. Introduction to selected topics in management science and operations research: decision analysis for management, mathematical programming, competitive analysis, and others.

156. Introduction to Mathematical Economics (4) I. The Staff

Lecture—4 hours. Prerequisite: course 100A and 155. Linear algebra for economists; necessary and sufficient conditions in static optimization problems; implicit function theorem; economic methodology and mathematics; comparative statics; envelope theorem; Le Chatelier principle; applications to production and consumer models.

157. Analysis for Production Management (4) III. The Staff

Lecture—4 hours. Prerequisite: course 100A; Statistics 103. Application of economic theory and quantitative methods in analyzing production management problems including inventory control, production scheduling, quality control, simulation, systems approach, and work measurement.

171A. Financial Management of the Firm (4) I, II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 106; Management 11A-11B. Financial analysis at the firm level: methods of depreciation; influence of the tax structure; inventory, cash, and accounts receivable management; sources of short-term and long-term financing, and financial problem solving using a computer spreadsheet program. (Students who have had or are taking Economics 134 may not receive credit for this course.)

171B. Financial Management of the Firm (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 171A. Financial analysis at the firm level: methods of capital budgeting; calculating the cost of capital; dividend policies; mergers and acquisitions; and special current topics in finance.

175. Natural Resource Economics (3) II. The Staff

Lecture—3 hours. Prerequisite: course 100B or Economics 100 or the equivalent. Economic concepts and policy issues associated with natural resources, renewable resources (ground water, forests, fisheries and wildlife populations), and non-renewable resources (minerals and energy resources, soil). (Same course as Environmental Studies 175.)

176. Environmental Economics (3) III. The Staff

Lecture—3 hours. Prerequisite: course 100B or Economics 100 or the equivalent. Analytical treatment of the role of the environment in economic activity and methods for protecting and enhancing environmental quality; implications of market failures for public policy; design of environmental policy; theory of welfare measurement; measuring the benefits of environmental improvement.

***190A. Senior Research Project (2)** II.

Lecture—1 hour; discussion—1 hour. Prerequisite: course 100A; Statistics 103 or consent of instructor; senior standing. Individual student-defined research project conducted under faculty guidance. Problem definition, study objectives, procedure, method of analysis, working outline, and preliminary elements of report writing to be completed in the first quarter. (Deferred grading only, pending completion of sequence.)

***190B. Senior Research Project (2)** III.

Lecture—1 hour; discussion—1 hour. Prerequisite: course 190A or consent of instructor. The research

report begun in course 190A will be completed and, after evaluation by the instructor, be revised and resubmitted by the student prior to the end of 190B. (Deferred grading only, pending completion of sequence.)

192. Internship (1-6) I, II, III, summer. The Staff (Chairperson in charge)
Internship—3-18 hours. Internship experience off and on campus in all subject areas offered in the Department of Agricultural Economics. Internships are supervised by a member of the staff. (P/NP grading only.)

197T. Tutoring in Agricultural Economics (1-3) I, II, III. The Staff (Chairperson in charge)
Hours and duties will vary depending upon the course being tutored. Prerequisite: senior standing in Agricultural Economics and consent of Department Chairperson. Tutor will lead small discussion groups affiliated with one of the department's regular courses, under the supervision of, and at the option of the instructor in charge of the course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200A. Microeconomic Theory (5) I. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: graduate standing. Linear and non-linear optimization theory applied to develop the theory of the profit-maximizing firm and the utility-maximizing consumer. (Same course as Economics 200A.)

200B. Microeconomic Theory (5) II. Helms (Economics)
Lecture—4 hours; discussion—1 hour. Prerequisite: course 200A. Characteristics of market equilibrium under perfect competition, simple monopoly and monopsony. Emphasis on general equilibrium and welfare economics; the sources of market success and market failures. (Same course as Economics 200B.)

200C. Microeconomic Theory (5) III. Makowski (Economics)
Lecture—4 hours; discussion—1 hour. Prerequisite: course 200B. Uncertainty and information economics. Individual decision making under uncertainty. Introduction to game theory, with emphasis on applications to markets with firms that are imperfect competitors or consumers that are imperfectly informed. (Same course as Economics 200C.)

204. Microeconomic Analysis (5) I. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: Economics 100 or courses 100A-100B and Mathematics 16A-16B; open to advanced undergraduates with consent of instructor. Economic reasoning and social choice: behavior of firms and households, theory of markets, partial and general equilibrium analysis, welfare economics, illustrations and applications. (Same course as Economics 204.)

214. Development Economics (4) II. The Staff
Lecture—4 hours. Prerequisite: course 100A, 100B, Economics 101; Agricultural Economics/Economics 204 and Economics 160A, 160B recommended. Review of the principal theoretical and empirical issues whose analysis has formed development economics. Analysis of economic development theories and development strategies and their application to specific policy issues in developing country contexts. (Same course as Economics 214.)

215A. Agriculture and Economic Development (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 200A or 204 and 214. Agricultural development theory and application. Analysis of rural-urban linkages and their role in economic development, food price policy, and interactions between economic development and the environment. Analytical focus on household-farm and intersectoral models. (Same course as Economics 215A.)

215B. Open Macroeconomics of Development (4) II. Kaneda
Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 200A or 204, 200D or 205, and 214 or 215A. Models and policy approaches regarding trade, monetary and fiscal issues, capital flows and debt are discussed in the macroeconomic framework of an open developing country. The basic analytical focus is real exchange rate and its impact on sectoral allocation of resources. (Same course as Economics 215B.)

215C. Empirical Approaches to Development Analysis (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 215A, 215B. Extension of development models for policy analysis including Household-Farm models, models of resource allocation under uncertainty. Social Accounting Matrix and Computable General Equilibrium models. Analysis and case studies of methods of project evaluation with and without income-distribution weights. (Same course as Economics 215C.)

***220. Economics of Consumer Policy (3) III.** The Staff
Lecture—3 hours. Prerequisite: one graduate course in economic theory and one course in econometrics or the equivalent. Policy criteria; sources of market failure; consumer policy alternatives; empirical evaluation of selected economic policies.

221. Agricultural Policy in Developed Countries (4) III. The Staff
Lecture/discussion—4 hours. Economic policy, its nature, formation and analysis; characteristics of agricultural sectors in developed countries; comparative analysis of policies relating to production, marketing, price, income, rural poverty, and resource adjustment; international trade policies for temperate zone agricultural commodities.

222. International Agricultural Trade and Policy (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B or Economics 204; Economics 106 or the equivalent. Analysis of country interdependence through world agricultural markets. Partial equilibrium analysis is used to study the impacts of national intervention on world markets, national policy choice in an open economy and multinational policy issues. Offered in alternate years.

240A. Econometric Methods (4) II. The Staff
Lecture—4 hours. Prerequisite: Statistics 133 and a course in linear algebra or the equivalent. Least squares, instrumental variables, and maximum likelihood estimation and inference for single equation linear regression model; linear restrictions; heteroskedasticity; autocorrelation; lagged dependent variables. (Same course as Economics 240A.)

240B. Econometric Methods (4) III. The Staff
Lecture—4 hours. Prerequisite: course 240A. Topics include analysis of variance, pooled time-series, cross-section estimation, seemingly unrelated regression, classical hypothesis tests, and identification and estimation of simultaneous equation models. (Same course as Economics 240B.)

240C. Econometric Theory (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 240B. Finite sampling theory; nonlinear and dynamic econometric models; asymptotic distribution theory. (Same course as Economics 240C.)

240D. Topics in Econometrics (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 240B. Advanced topics in nonlinear econometric modelling. Contents may vary from year to year. (Same course as Economics 240D.)

252. Applied Linear Programming (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Applied linear programming methods emphasizing uses for business decisions: production, diet, blending, network and related problems.

253. Optimization Techniques with Economic Applications (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 200C. Optimiza-

tion techniques and methods including linear and nonlinear programming. Empirical applications to household, firm, general equilibrium growth and economic problems.

254. Dynamic Optimization Techniques for Economic Systems with Applications (4) II. The Staff
Lecture—4 hours. Prerequisite: course 253. Dynamic programming, Pontryagin maximum principle, and optimal control problem. Emphasis on methods with selected applications to economic problems.

***255. Systems Analysis and Simulation (3) III.** The Staff
Lecture—3 hours. Dynamic model formulation and computer simulation of economic systems.

256. Applied Econometrics (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Master students in agricultural economics or economics, or consent of instructor. Application of statistical tools to economic and business analysis. Emphasis on regression analysis, problems of specification, and model development. (Same course as Economics 256.)

***257. Analysis and Applications in Production Economics (4) III.** The Staff
Lecture—4 hours. Prerequisite: courses 204, 252, and 256 or the equivalent. Micro-level analysis of decision problems in agricultural production processes, e.g., investment, resource conservation, pest management, and irrigation scheduling. Covers static and dynamic models under risk and uncertainty and some aggregate aspects of production.

258. Demand and Market Analysis (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 204 and 256 or consent of instructor. Quantitative and theoretical analysis of the factors affecting supply, demand and price determination for agricultural products. Emphasis on analytical tools for assessing the impacts of changes in government policies and macroeconomic variables.

261. Case Problems in Management (3) II. The Staff
Lecture—1 hour; discussion—2 hours. Case problem analysis and discussion of business policy and strategy including organization, planning, production, marketing, and financing issues. Emphasis is on problem definition and solution using current examples drawn primarily from agriculturally oriented firms.

276. Institutional and Economic Analysis of Natural Resources (3) I. The Staff
Lecture—2 hours; discussion—1 hour. Prerequisite: course 204/Economics 204 or consent of instructor. Natural resources are developed and allocated in a milieu of institutional arrangements that significantly affect their economic yields: definition/enforcement of property rights; information and search costs; market externalities, transactions and adjustment costs. Applications to land/water policy.

280. Analysis of Research in Production Economics (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Current problems and methods of analysis in agricultural production economics research. Emphasizes both firm and industry.

281. Analysis of Research in Agricultural Marketing (4) II. The Staff
Lecture—4 hours. Current problems and methods in agricultural market analysis with emphasis on marketing sector firm behavior. Topics include market definition, marketing margins and derived demand, spatial markets, technology analysis, models of imperfect competition, cooperatives, and marketing orders.

283. Analysis of Research in Natural Resource Economics (3) III. The Staff
Lecture—3 hours. Prerequisite: course 254. Scope and disciplinary context of natural resource economics. Recent problems affecting policy and use planning including efficiency and welfare criteria, technological externalities, public goods, extramarket goods, indivisibilities, and intertemporal problems, benefit cost analysis and public and private investment criteria.

284. Applied Demand Analysis (4) III. The Staff
Lecture—4 hours. Prerequisite: courses 200A, 240A, and 240B. Issues, techniques and methodology currently used in applied demand analysis. Demand parameter estimates will be used to answer various policy questions. Problem identification, model specification, hypothesis stipulation, and econometric estimation of various demand models.

***290. Introduction to Research in Agricultural Economics (1) I.** The Staff

Seminar—1 hour. Prerequisite: graduate standing in Agricultural Economics. Seminar to familiarize entering students with research issues, research applications, research methodology, information sources and problem identification. Focus is on underlying motivations, usefulness and scope of agricultural economics research. (S/U grading only.)

***291. Advanced Research Development (1) I.** The Staff

Seminar—1 hour. Prerequisite: second-year Ph.D. standing. Current research problems and activities; guidance on the selection, design, funding and manageability of projects. (S/U grading only.)

293. Analysis of California Agriculture and Resources (3) III. The Staff

Lecture—1.5 hours; fieldwork—45 hours total of field trip, including one 5-day summer field trip. Review of analysis of production, marketing, and resource issues facing agricultural firms in California. Application of economic theory and measurement to individual firm and industry decisions in an applied setting. (S/U grading only.)

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Advanced study through special seminars, informal group studies, or group research on problems for analysis and experimentation. Sections: (1) Managerial Economics; (2) Agricultural Policy; (3) Community and Regional Development; (4) Natural Resources; (5) Human Resources; (6) Research Methods and Quantitative Analysis.

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)

Sections: (1) Managerial Economics; (2) Agricultural Policy; (3) Community and Regional Development; (4) Natural Resources; (5) Human Resources; (6) Research Methods and Quantitative Analysis; and (7) Dissertation Research Prospectus. (S/U grading only.)

299D. Special Study for Doctoral Dissertation (1-12) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

Agricultural Education

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Agronomy and Range Science.

Major Program. An undergraduate program leading to a bachelor of science degree is offered in Agricultural Systems and Environment with a specialization in Agricultural and Environmental Education.

Advising Center for the major is located in 132 Hunt Hall (916-752-1715).

Teaching Credential Subject Representative. You may make an appointment with a credential counselor and obtain a statement of the complete requirements for the credential at the Agricultural Education Program Office, 132 or 261 Hunt Hall (916-752-1808 or 4369). Since many majors in the College do not offer the minimum preparation necessary for entering the Agriculture Teaching Credential program, you are encouraged to seek counseling as early as possible. See also the Teacher Education Program.

Graduate Study. For graduate study refer to the Graduate Studies section in this catalog. The Department of Applied Behavioral Sciences offers a program of study leading to the M.Ed. degree. Further infor-

mation may be obtained from the Department and the *Graduate Announcement*.

Graduate Adviser. J.G. Leising (*Agronomy and Range Science*).

Courses in Agricultural Education (AED)

Questions pertaining to the following courses should be directed to the instructor or to the Agricultural Education Program Office, 132 Hunt Hall.

Lower Division Courses

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: lower division standing; consent of instructor. Supervised internship off and on campus in areas of agricultural education. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Concepts in Agricultural and Environmental Education (3) I. The Staff

Lecture—2 hours; laboratory—3 hours. Prerequisite: upper division standing. Philosophy and nature of formal and nonformal agricultural and environmental education programs. Emphasis on understanding the role of the teacher and observing a variety of programs.

160. Vocational Education (3) II. Leising

Lecture—3 hours. Philosophy and organization of vocational education, with particular reference to educational principles for agriculture, commerce, home economics, and industry.

***163. Measurement and Evaluation in Teaching (3) II.** The Staff

Lecture—3 hours. Prerequisite: elementary statistics; upper division standing. Development of selection, use and assessment of evaluation procedures for measuring cognitive, affective and psychomotor growth.

171. Audio Visual Communications (2) II. The Staff

Lecture—1 hour; laboratory—3 hours. Prerequisite: upper division standing. Theory and principles of audio-visual communications. Comparison of audio-visual materials such as transparencies, slides, computer-generated graphics, and videos. Operation and use of audio-visual equipment is stressed.

172. Multi-Media Productions (3) III. The Staff

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 171 recommended. Design and production of educational, technical, and professional multi-media presentations. Instructional or professional presentations using a variety of media, including slides, video, transparencies, and computer-generated graphics.

190. Seminar in Agricultural Education (2) II. The Staff

Seminar—2 hours. Discussion of selected critical issues in agricultural education. May be repeated for credit with consent of instructor. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: upper division standing; consent of instructor. Supervised internship off and on campus in areas of agricultural education. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Professional Courses

300. Directed Field Experience in Teaching (2) III. The Staff

Discussion—1 hour; field experience—3 hours. Prerequisite: course 100. Experience as teaching assistant in agriculture or home economics programs in public schools. May be repeated once for credit. (P/NP grading only.)

301. Planning for Instructional Programs (3) III. Leising

Lecture—3 hours. Prerequisite: course 100; course 300 (may be taken concurrently). Major paradigms in program planning and development. Emphasis on key steps in curriculum development, including selection and organization of educational objectives, learning experiences and teaching materials and resources.

302. Teaching Methods in Education (3) III. Leising
Lecture—1 hour; discussion—2 hours. Prerequisite: courses 100, 300 and 301. Development of teaching strategies, with special emphasis on the designing of learning experiences, instructional execution, teaching aids.

306A. Field Experience with Future Farmers of America and Supervised Experience Programs (4) I. Leising

Lecture/discussion—2 hours; field work—6 hours. Prerequisite: acceptance into the Teacher Education Program; course 306B (concurrently). Develop an understanding of the Future Farmers of America and supervised occupational experience programs through planning, conducting, and evaluating actual programs.

306B. Field Experience in Teaching Vocational Agriculture (5-18) I. Leising

Student teaching (corresponds with public school session). Prerequisite: acceptance into the Teacher Education Program; course 306A (concurrently); courses 100, 300, 301, 302. Directed teaching including supervision of occupational experience programs and youth activities in secondary schools or community colleges.

***307. Teaching in Secondary Schools (5-18) I.** The Staff

Student teaching (corresponds with public school session). Prerequisite: acceptance into Teacher Education Program; courses 100, 300, 301, 302. Supervised teaching in secondary school or community college general agriculture or home economics programs. (Deferred grading only, pending completion of course.)

323. Resource Development: Agricultural Education (3) II. Leising

Lecture—3 hours. Prerequisite: courses 306A, 306B. Selection and implementation of community resources in teaching.

390. Seminar: Issues in Agricultural and Home Economics Education (2) III. The Staff

Seminar—2 hours. Prerequisite: acceptance into the Teacher Education Program; courses 306A-306B or 307. Discussion and evaluation of current issues, theories and research in home economics and agricultural education. (S/U grading only.)

Agricultural Systems and Environment

(College of Agricultural and Environmental Sciences)

Faculty. See under Department of Agronomy and Range Science, Pomology and Vegetable Crops.

The Major Program

This major is designed for students who are interested in understanding agricultural systems as they relate to the environment and society. Courses are selected to provide an interdisciplinary background that

encompasses both natural science and social science disciplines. Students will acquire a core understanding of agricultural production systems as managed ecosystems, how they function, how they interact with the natural environment and how they are intimately connected with human society and social changes. In addition, students will develop an area of specialization. Within each of these areas of specialization, students choose between a broad-based education and one focused in selected areas.

The Program. Specialization in Sustainable Production Systems covers food and agricultural production, agroecology, pest ecology and management, crop improvement and propagation. Students may also develop an emphasis in particular production areas such as agronomy, environmental horticulture, pomology, vegetable crops or viticulture. Specialization in Agricultural and Environmental Management encompasses agricultural and environmental resource management, agricultural and resource economics, pest management, animal and range management. The Agricultural and Environmental Education specialization provides preparation in educational foundations, planning and teaching strategies, with development of an agriculture and environment emphasis. Specialization in Agricultural and Environmental Communication and Information offers preparation in agricultural and environmental science, along with in-depth understanding of communication and information management.

All students will gain practical experience through a combination of internships and practica. In addition, students may pursue an Honors thesis in their senior year.

Career Alternatives. Graduates from this program will be prepared to pursue a wide range of careers, including various technical and management positions in agricultural and business enterprises; farming; state and federal agencies concerned with land and resource management; Cooperative Extension; international development; teaching; nonformal education; human resource development; and agricultural and environmental journalism, information and communication services. Students will also be qualified to pursue graduate studies in the natural and social sciences, such as agroecology, environmental studies, pest management, education, business management.

B.S. Major Requirements:

(For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. Courses shown without parentheses are required.)

UNITS

English Composition/Rhetoric Requirement11-12
 English and rhetoric (English 1 or 3 and Rhetoric and Communication 1)8
 Additional English requirement (English 102 or 103)3-4

Perspectives on Agriculture and the Environment19
 Agriculture, Nature and Society (Agricultural Systems and the Environment 1)4
 Botany of Agricultural Plants (Agricultural Systems and the Environment 2)4
 Introduction to Agricultural Ecosystems (Agricultural Systems and the Environment 22)4
 Agriculture and the Environment (Agricultural Systems and the Environment 101)3
 Animals and People (Animal Science 1 or 2)4

Preparatory Subject Matter40-43
 Biological sciences (Biological Sciences 1A-1B)10
 General chemistry (Chemistry 2A-2B)10
 Physics (Physics 1A-1B or Physics 5A-5B; see specializations)6-8
 Mathematics (Mathematics 16A)3

Computer skills (Agricultural Systems and the Environment 21)3
 Statistics (Agricultural Systems and the Environment 120 or Statistics 13 or 102)3-4
 Economics (Economics 1A)5

Breadth/General Education16-24
 To include one class from each of the following two groups of courses:
Social, Cultural & Ethnic Studies: Anthropology 2, 101, 129, 133; Asian American Studies 1, 2, 100; Chicano Studies 130, 132; Native American Studies 10, 70; Sociology 1, 3, 110, 129, 132, 144; Women's Studies 50.
History, Policy, & Philosophy of Science: History 135A or B, 136, 188A, B; History and Philosophy of Science 130A, B, 150; Philosophy 108; Political Science 3, 123, 124.
Recommended: to meet the Civilization and Culture general education requirement, minor in History and Philosophy of Science or a foreign language; courses in anthropology, cultural geography and nutrition (Anthropology 1; Geography 2, 50; Nutrition 10), geology and physical geography (Geology 1, 20, 50; Geography 1), and climate and weather (Atmospheric Science 105; Geography 1, 3) to complement one's area of specialization.

Depth Subject Matter20-21
 Crop biology and ecology (Agricultural Systems and the Environment 150 or Plant Science 101 or 145)4
 Agricultural economics (Agricultural Economics 113 or 140)4-5
 Ecological principles (Plant Biology 117 or Environmental Studies 100)4
 Agricultural practicum (Agricultural Systems and the Environment 92, 99; Agricultural Economics 49A, 49B, 49C; Animal Science 49A, B, C; Applied Biological Systems Technology 49, 52, 145)3
 Internship (Agricultural Systems and the Environment 192, 199)3
 Seminar (Agricultural Systems and Environment 190)2

Senior Thesis. The Senior Honors Thesis includes two or three successive quarters of guided, scientific and/or scholarly research on an agricultural and/or environmental subject of special interest to the student.

With adviser approval the Senior Thesis can satisfy up to 12 units of restricted electives in the major.

Areas of Specialization (choose one):

Sustainable Production Systems42-56
 Includes food and agricultural production, agroecology, crop improvement, propagation, and pest management. Restricted electives allow students to choose between a broad education in sustainable agriculture or to focus on one or two areas of agriculture (e.g., agronomy, crop improvement, environmental horticulture, pest management, pomology, vegetable crops, viticulture).
 Ecology of cropping systems (Plant Science 101 and Agricultural Systems and Environment 150)4-8
 Genetics (Plant Science 105 or Biological Science 101)4
 Soils (Soil Science 100)4
 Restricted elective courses chosen with approval of the academic adviser from the following groups30-40
Agricultural production systems (Agronomy 100, 111, 112, 113; Animal Science 41; Environmental Horticulture 125, 130, 133; International Agricultural Development 101, 102; Pomology 101, 102, 103, 107; Range Science 134, 135; Vegetable Crops 101; Viticulture and Enology 101A, 101B, 101C, 111, 115, 116)12-16

Plant improvement and propagation (Plant Science 103, 105, 107, 109, 113, 140; Vegetable Crops 118)3-4
Plant physiology or plant nutrition (Botany 111, 135; Plant Science 102, 110, 112, 126, 135; Viticulture and Enology 110)3-4
Atmospheric, soil or water science (Atmospheric Science 105, 133; Hydrologic Science 100, 110, 124; Soil Science 107, 109, 111)3-4
Pest ecology and management (Botany 120, 121; Entomology 110, 115, 135; Nematology 100; Plant Pathology 120; Viticulture and Enology 118)6-8
Policy, social science and ethics (Agricultural Economics 147, 176; Agricultural Systems and Environment 121; Economics 123; Environmental Studies 161, 175; Geography 142; Plant Pathology 140; Political Science 107; Water Science 150)3-4
 Unrestricted Electives6-31
 Recommended courses: Mathematics 16B, Physics 5A-5B, Agricultural Biological Technology 49 and courses listed under Plant, Animal and Environmental Sciences.

Agricultural and Environmental Management51-61

Includes agricultural and environmental resource management, natural resource and agricultural economics, agricultural production, pest management, animal and range management. Restricted electives will allow students to choose between a broad education in resource management or to focus on one or two specific areas.

Computer and quantitative skills (Agricultural Systems and Environment 121)4
 Soil science (Soil Science 100)4
 Economics (Economics 1B, Management 11A and 11B)13
 Restricted elective courses chosen with approval of the academic adviser from the following groups:
Environment and resource management (Environmental and Resource Sciences 103, 121, 131; Environmental Studies 126, 155, 172, 173; Environmental Toxicology 112A, 114A, 131; Landscape Architecture 183, 184; Range Science 100, 134, 135; Soil Science 118; Wildlife and Fisheries Biology 110, 111, 120, 151, 153; Hydrologic Science 103, 122)6-8
Economics and business management (Agricultural Economics 100A, 112, 113, 118A, 130, 136, 140, 145, 171A, 175)6-8
Agricultural production systems (Agricultural Systems and Environment 100, 107, 110, 110L, 111, 112, 113, 118, 150; Animal Science 41; Environmental Horticulture 125, 130, 133; International Agricultural Development 101, 102; Plant Science 115, 116; Range Science 134, 135; Viticulture and Enology 101A, 101B, 101C, 111, 115, 116)6-8
Plant science (Agricultural Systems and Environment 118; Plant Biology 111, 135; Plant Science 101, 103, 105, 109, 110, 112, 113, 126, 135, 140, 145; Viticulture and Enology 110)3-4
Atmospheric, soil or water science (Atmospheric Science 105, 133; Hydrologic Science 100, 110, 124; Soil Science 107, 109, 111)3-4
Pest ecology and management Entomology 110, 115, 135; Nematology 100; (Plant Biology 120, 121; Plant Pathology 120; Viticulture and Enology 118)3-4

*Course not offered this academic year.

Policy, social science and ethics (Economics 147, 176; Agricultural Systems and Environment 121; Geography 142; Hydrologic Science 150; Plant Pathology 140; Political Science 107)3-4

Unrestricted Electives1-22
 Recommended courses: Mathematics 16B, Physics 5A-B, and courses listed under Plant, Animal and Environmental Sciences.

Agricultural and Environmental Education..38-45

The Agricultural and Environmental Education Specialization includes preparation in educational foundations, planning and teaching strategies, and development of an agricultural and environmental science emphasis. This option, along with a broad preparation in the natural sciences, social sciences and agriculture, prepares the student for entry into the graduate agriculture teaching credential program, for employment in the private sector in areas of training and human resource development, for working in non-formal educational programs involving environmental education, outdoor education, 4-H and other youth organizations, and pursuing further graduate studies in the social or natural sciences.

Soil science (Soil Science 10 or 100)3-4
 Concepts in agricultural and environmental education (Agricultural Education 100).....3

Directed field experience in teaching (Agricultural Education 300)2

Educational foundations (Education 110 and 120)8

Planning and teaching strategies (Agricultural Systems and Environment 101 or Education 180; Agricultural Education 171, 301 and 302).....12-13

Agricultural and environmental science emphasis.....10-15

Courses to be selected in consultation with academic adviser. Students typically will select one area of agriculture to develop a strength by taking three to four courses. Students pursuing the Graduate Agricultural Teaching Credential Program need at least 10 units of Animal Science, 10 units of Plant and Soil Science, 8 units of Agricultural Economics, and 8 units of Agricultural Mechanics. See adviser for list of required courses.

Unrestricted Electives17-35
 Recommended courses listed under Plant, Animal and Environmental Sciences.

Agricultural and Environmental Communications and Information Management40-52

This specialization provides broad preparation in the agricultural and environmental sciences along with in-depth understanding of communications and information management. The option is intended to prepare individuals for careers in agricultural and environmental science journalism, newscasting, information services and industrial communications.

Soil science (Soil Science 10 or 100)3-4
 Management of information (Agricultural Education 101)4

Technical writing (English 104).....1-3

Upper division internship (Agricultural Education 192)6-9

Information media (Agricultural Education 171, 172; Rhetoric and Communication 140, 142A, 142B)12-13

Communications and information transfer (Applied Behavioral Sciences 170; Rhetoric and Communication 130, 136)4

Agricultural and environmental communications and information emphasis.....10-15

Courses to be selected in consultation with academic adviser. Students typically will select one area of agriculture to develop a strength by taking three to four courses.

Unrestricted Electives10-33

Recommended courses listed under Plant, Animal and Environmental Sciences.

Total Units for the Major180

Major Adviser: Carol Shennan.

Advising Center located in 132 Hunt Hall (916-752-1715).

Minor Program Requirements:

Agricultural Computing and Information Systems Minor

UNITS

Agricultural Computing and Information Systems.....18-19

Agricultural Computing and Information Systems—core courses: Agricultural Systems and Environment 120, 121, Animal Science 12811

Minimum of 7 units from two of the three following groups:

(a) *Computer systems, statistics, and simulation:* Biological Systems Engineering 165, Applied Behavioral Sciences 160, Statistics 108, 110, 141, Agricultural Economics 106, 112, 155, Hydrologic Science 1543-4

(b) *Communication and business organization:* Agricultural Economics 112, Applied Behavioral Sciences 168, Rhetoric and Communication 103, 1363-4

(c) *Instrumentation and control:* Food Science and Technology 156, Biological Systems Engineering 1653-4

Minor Adviser. R.E. Plant (*Agronomy and Range Science*), J. Fadel (*Animal Science*).

Advising Center is located in 132 Hunt Hall (916-752-1715).

Courses in Agricultural Systems and Environment (ASE)

Lower Division Courses

1. Agriculture Nature and Society (3) I. Gradziel (Pomology)

Lecture—3 hours. Multiple perspectives and connections between the natural sciences, social sciences, and agriculture. Emphasis on agriculture's central position between nature and society and its key role in our search for a productive, lasting and hospitable environment. Not open for credit to students who have completed Agrarian Studies 2. General Education credit with concurrent enrollment in course 1G: Nature and Environment.

1G. Agriculture Nature and Society: Discussion

(1) I. Gradziel (Pomology)
 Discussion—1 hour. Prerequisite: concurrent enrollment in course 1. Discussion of additional readings and topics. Saturday field trip to view California agriculture. General Education credit with concurrent enrollment in course 1: Nature and Environment.

2. Botany and Physiology of Cultivated Plants (4)

II. Saltveit (Vegetable Crops)
 Lecture—3 hours; discussion/laboratory—3 hours. Prerequisite: high school course in biology and chemistry recommended. A holistic introduction to the underlying botanical and physiological principles of cultivated plants and their response to the environment. Includes concepts behind plant selection, cultivation, and utilization. Laboratories include discussion and interactive demonstrations.

21. Applications of Microcomputers in Agriculture

(3) I, II. Zilbert; III. Plant (Agronomy and Range Science)
 Lecture—1 hour; laboratory/discussion—4 hours. Prerequisite: high school algebra. Concepts of computing and applications using personal computers; spreadsheets, database management, word processing and communications. Not open for credit to

students who have completed Agricultural Science and Management 21.

22. Introduction to Agricultural Ecosystems (4) III. Shennan (Vegetable Crops), Van Horn (Agronomy and Range Science)

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 2A, Chemistry 2B (may be taken concurrently), and course 2 or the equivalent. Role of the biological and physical components of agricultural ecosystems and the structure, function and management of whole agro-ecosystems. Comparative analysis of important agricultural systems and practices. On- and off-campus field trips.

90X. Agricultural Systems and Environment Seminar (1-4) I, II, III. The Staff

Seminar—1-4 hours. Prerequisite: consent of instructor. Examination of a special topic in a small group setting.

92. Internship (1-12) I, II, III. The Staff (Director in charge)

Internship—3-36 hours. Prerequisite: consent of instructor. Work experience on or off campus in all subject areas pertaining to agricultural and environmental sciences. Internship supervised by faculty member in the animal, plant, and environmental sciences. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Director in charge)

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Director in charge)

Primarily intended for lower division students. (P/NP grading only.)

Upper Division Courses

100. Principles of Vegetable Crops Production (4) III. Jones

Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1C and/or Plant Science 2. Fundamentals of vegetable crop production, handling, processing, utilization and distribution. Not open for credit to students who have completed Vegetable Crops 101. (Former course Vegetable Crops 101.)

101. Agriculture and the Environment (3) III. Demment

Lecture—2.5 hours; Saturday field trip. Prerequisite: course 22 and consent of instructor. Focus on the interaction between agriculture and environment to address the principles required to analyze conflict and develop solutions to complex problems facing society.

107. Small Fruit Production (2) II. Shaw

Lecture—2 hours; two field trips arranged at mutual convenience. Prerequisite: Biological Sciences 1C or the equivalent. Strawberries (*Fragaria*), blackberries-raspberries (*Rubus*), blueberries-cranberries (*Vaccinium*), and currants-gooseberries as important nutritional resources; their origin, production and utilization with emphasis on recent progress in integrated management. Offered in alternate years. Not open for credit to students who have completed Pomology 107. (Former course Pomology 107.)

110. Principles of Agronomy (3) III. Travis

Lecture—3 hours. Prerequisite: a course in general botany and/or course 2 or consent of instructor. Fundamentals of field crop production and agronomic problem solving using ecological, physiological, and genetic principles. Economic, political and social problems are considered in relationship to technological problems if they either impair or provide the means to promote agricultural development. Not open for credit to students who have completed Agronomy 100. (Former course Agronomy 100.)

***110L. Principles of Agronomy Laboratory (1)** III. Travis

Laboratory—3 hours. Prerequisite: course 110 (may be taken concurrently). Field-oriented introduction to principles of agronomic crop production. Offered in alternate years. Not open for credit to students who have completed Agronomy 100L. (Former course Agronomy 100L.)

***111. Cereal Crops of the World (4) III.** Qualset
Lecture—3 hours; laboratory—3 hours. Prerequisite:
courses 100, 100L. Contributions of cereal crops to
human development. Adaptation, production, utiliza-
tion, and factors determining quality of wheat, oats,
barley, rice, corn, and sorghum. Emphasis is on re-
cent developments and scientific improvements. Half-
day field trip will be required. Offered in alternate
years. Not open for credit to students who have com-
pleted Agronomy 111. (Former course Agronomy
111.)

112. Forage Crop Ecology (3) III. The Staff
Lecture—3 hours. Prerequisite: Biological Sciences
1C or consent of instructor. Forages as a world
resource in food production. Ecological principles
governing the adaptation, establishment, growth and
management of perennial and annual forages, includ-
ing pastures, rangelands and hay; aspects of forage
quality which affect feeding value to livestock. Offered
in alternate years. Not open for credit to students who
have completed Agronomy 112. (Former course
Agronomy 112.)

***113. Fiber, Oil and Sugar Crops in a Changing
World (4) I.** Rains

Lecture—3 hours; laboratory—3 hours. Prerequisite:
courses 100, 100L; Biological Sciences 1C. Indus-
trial crops as world resources of food, feed, fiber, and
consumer goods. The relationship of crops to their
physical and biotic environment; technological
changes; socioeconomic and political forces that
shape crop production, and utilization practices.
Offered in alternate years. Not open for credit to stu-
dents who have completed Agronomy 113. (Former
course Agronomy 113.)

118. Seed Production and Quality (4) III. Bradford
Lecture—3 hours; laboratory—3 hours. Prerequisite:
course 2 or Biological Sciences 1C; Plant Science 105
recommended. Principles of crop seed production,
storage and utilization. Biological and environmental
factors influencing seed quality. Measurement and
preservation of seed vigor and viability. Technological
aspects of crop establishment from seeds. Labora-
tories include field trips to seed industry facilities.
Offered in alternate years. Not open for credit to stu-
dents who have completed Vegetable Crops 118.
(Former course Vegetable Crops 118.)

120. Applied Statistics in Agricultural Science (4)
I. Geng (Agronomy and Range Science)
Lecture—3 hours; discussion/laboratory—2 hours.
Prerequisite: upper division standing. Applications of
statistical methods to the analysis and interpretation of
research data in plant, animal, behavioral, food and
nutritional sciences. Lectures cover basic concepts
and statistical methods. Specialized laboratory sec-
tions cover procedures, data processing and inter-
pretations. Not open for credit to students who have
completed Agricultural Science and Management
150.

**121. Systems Analysis in Agriculture and
Resource Management (4) I.** Plant (Agronomy and
Range Science)
Lecture—2 hours; discussion/laboratory—2 hours.
Prerequisite: course 21 or equivalent computer expe-
rience, and Mathematics 16A. The process of sys-
tems analysis and dynamic simulation of biological
and environmental systems, use of systems analysis
for development of optimal management strategies for
agricultural and environmental systems. Not open for
credit to students who have completed Agricultural
Science and Management 121. General Education
credit: Nature and Environment.

**122. Management of Information for the Agricul-
tural and Environmental Sciences (4) II.** Zilbert
(Agronomy and Range Science)
Lecture—3 hours; laboratory—3 hours. Prerequisite:
course 21 or consent of instructor. Introduction to sys-
tems and technology for acquiring, storing, manipu-
lating and communicating various types of information
including numerical data, text, graphics and multime-
dia images. Laboratory exercises introduce a wide
variety of information management systems used in
offices and laboratories. Not open for credit to students
who have taken former course 101.

150. Cropping Systems of the World (4) II. Shennan
Lecture—3 hours; discussion—1 hour. Prerequisite:
course 2 or Biological Sciences 1C, and course 22 or
Plant Science 101. World food production systems:
concepts and assessment of sustainability; evaluation
of methodological approaches to study and improve
farming systems; socioeconomic and gender consid-
erations. Examination of case studies from selected
annual and perennial cropping systems. One week-
end session for simulation game.

170A. Fruit and Nut Cropping Systems (2) I.
McGranahan, Ferguson

Lecture—1 hour; laboratory—3 hours. Prerequisite:
course 2, Biological Sciences 1C, or consent of
instructor. Overview of production and handling sys-
tems of major pomological crops, analysis of current
cultural and harvesting problems and concerns asso-
ciated with commercial fruit growing. Offered in alter-
nate years. Not open for credit to students who have
completed Pomology 170A. (Former course Pomol-
ogy 170A.)

170B. Fruit and Nut Cropping Systems (2) III.
DeJong

Lecture—1 hour; laboratory—3 hours. Prerequisite:
course 2, Biological Sciences 1C, or consent of
instructor. Overview of production and handling sys-
tems of major pomological crops, including analysis
of current cultural and harvesting problems and con-
cerns associated with commercial fruit growing.
Offered in alternate years. Not open for credit to stu-
dents who have completed Pomology 170B. (Former
course Pomology 170B.)

190. Seminar on Alternatives in Agriculture (2) II.
Van Horn (Agronomy and Range Science)

Seminar—2 hours. Prerequisite: upper division stand-
ing. Seminar on topics related to alternative theories,
practices and systems of agriculture and the relation-
ship of agriculture to the environment and society. Sci-
entific, technological, social, political and economic
perspectives. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Director in
charge)

Internship—3-36 hours. Prerequisite: consent of
instructor. Supervised internship on and off campus in
agricultural and environmental sciences. (P/NP grad-
ing only.)

194H. Senior Honors Thesis (2-6) I, II, III. The Staff
Independent study. Prerequisite: Agricultural Systems
and Environment major; senior standing; overall GPA
of 3.25 or higher and consent of master adviser. Two
or three successive quarters of guided research on an
agriculturally related subject of special interest to the
student. Not open for credit to students who have
completed Agrarian Studies 188H. (P/NP grading
only; Deferred grading only, pending completion of
thesis.)

195. Field Study of Vegetable Industry (1) III.
Jackson

Field Study. Prerequisite: consent of instructor. Field
study illustrating different aspects of California agri-
culture, including research institutions, farm opera-
tions, field stations, Extension Service, marketing,
processors, equipment, etc. To be given between
winter and spring quarters. Considered a spring
course for preenrollment. Not open for credit to stu-
dents who have completed Vegetable Crops 195.
(Former course Vegetable Crops 195.) (P/NP grad-
ing only.)

198. Directed Group Study (1-5) I, II, III. The Staff
(Director in charge)
Prerequisite: consent of instructor. (P/NP grading
only.)

**199. Special Study for Advanced Undergraduates
(1-5) I, II, III.** The Staff (Director in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Agronomy

(College of Agricultural and Environmental Sciences)

Faculty. See under Department of Agronomy and
Range Science.

Major Program. See the major in Agricultural Sys-
tems and Environment.

Graduate Study. A program of study is offered lead-
ing to the M.S. degree in Agronomy. Information can
be obtained in the Advising Office at 137 Hunt Hall.
Also see the Graduate Studies section in this catalog.

Graduate Adviser. L. Jackson.

Related Courses. Agronomy and Range Science fac-
ulty also teach the following courses that contribute
to majors and graduate programs in Agriculture
Teaching Credential, Agricultural Systems and Envi-
ronment, Ecology, Genetics, International Agricultural
Development, and Plant Biology:

Agricultural Education 100, 160, 163, 171, 172, 190,
300, 301, 302, 306A, 306B, 307, 323, 390, Agricultural
Systems and Environment 21, 22, 101, 110, 110L,
111, 112, 113, 120, 121, 122, 190, Ecology 206, 207,
Genetics Graduate Group 201A, 201B, International
Agricultural Development 101, 200, Plant Biology 116,
Plant Biology Graduate Group 220, 233, 401, Plant
Science 101, 103, 105, 110, 145.

Courses in Agronomy (AGR)

*Questions pertaining to the following courses should
be directed to the instructor or to the Advising Cen-
ter, 132 Hunt Hall.*

Concordance

The following courses in Agronomy have been trans-
ferred to other subject areas.

Former Course Number	Equivalent new course and number
100	Agricultural Systems and Environment 110 (Principles of Agronomy)
100L	Agricultural Systems and Environment 110L (Principles of Agronomy Laboratory)
111	Agricultural Systems and Environment 111 (Cereal Crops of the World)
112	Agricultural Systems and Environment 112 (Forage Crop Ecology)
113	Agricultural Systems and Environment 113 (Fiber, Oil, and Sugar Crops in a Changing World)

Lower Division Course

92. Agronomy Internship (1-12) I, II, III, summer.
The Staff (Department Chairperson in charge)
Internship—3-36 hours. Prerequisite: consent of
instructor. Internship on or off campus in all subject
areas pertaining to agronomy. Internships supervised
by a member of the faculty. (P/NP grading only.)

Upper Division Courses

192. Internship (1-12) I, II, III, summer. The Staff
(Department Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84
units and consent of instructor. Internship on or off
campus in all subject areas pertaining to agronomy.
Internships supervised by a member of the faculty.
(P/NP grading only.)

197T. Tutoring in Agronomy (1-5) I, II, III. The
Staff (Chairperson in charge)
Tutoring—1-5 hours. Prerequisite: course to be
tutored or the equivalent; upper division standing and
consent of instructor. Designed for undergraduate
students who desire teaching experience. Student will
assist in courses under the direction of the faculty.
May be repeated for credit up to a total of 5 units.
Same course may not be tutored more than one time.
(P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: 6 upper division units of agronomy. (P/NP grading only.)

Graduate Courses

205A. Design, Analysis and Interpretation (4) II. Geng

Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Systems and Environment 120. Planning and analysis of field and laboratory experiments with emphasis on concept and technique of designing experiments. Randomized block, factorial, incomplete block and multivariate designs discussed together with appropriate methods of data analysis and interpretation.

205B. Design, Analysis and Interpretation (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Systems and Environment 120 or the equivalent; Agricultural Systems and Environment 21 recommended. Planning and analysis of field and laboratory experiments with emphasis on use of multiple regression, multivariate analysis, and dynamic simulation techniques in the biological interpretation of results.

207. Plant Population Biology (3) II. Rice

Lecture—2 hours; laboratory/discussion—1 hour. Prerequisite: advanced undergraduate ecology course (e.g., Environmental Studies 100, Evolution and Ecology 125, Plant Biology 117, or Entomology 104); an advanced undergraduate course in genetics and/or evolution (e.g., Biological Sciences 101 or Evolution and Ecology 100). Provides entry-level graduate students and advanced undergraduates with an introduction to both theoretical and empirical research in plant population biology. Emphasis will be placed on linking ecological and genetic approaches to plant population biology. Offered in alternate years. (Same course as Ecology 207.)

211. Principles and Practices of HPLC (2) III. Goyal

Lecture—1 hour; laboratory—3 hours. Prerequisite: undergraduate physics and chemistry; Biological Sciences 102, 103 recommended. Principles and theory of HPLC involving various modes of separation and detection. Optimization of separation using isocratic and gradient elution. Develop practical knowledge about the use, maintenance and troubleshooting of HPLC equipment, including HPLC columns. Development of new HPLC methods.

221. Advanced Plant Breeding (4) III. Teuber
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 205A; Evolution and Ecology 102; Plant Science 113. Philosophy, methods, and problems in developing improved plant species. Topics include: inbreeding, heterosis, progeny testing, breeding methodology, index selection, germplasm conservation, and breeding for stress resistance. Laboratories include tours of breeding facilities and calculation and interpretation of quantitative data. Offered in alternate years.

222. Quantitative Genetics and Plant Improvement (4) II. Qualset

Lecture—4 hours. Prerequisite: Plant Science 113; Evolution and Ecology 102; or consent of instructor. Genetic forces affecting populations. Formulation of breeding plans based on principles of population and quantitative genetics. Offered in alternate years.

***223. Selection Theory in Plant Breeding** (3) II. Qualset

Lecture—2 hours; discussion—1 hour. Prerequisite: course 222 or consent of instructors. Theory and application of selection to plant populations for improvement of quantitative characters. Statistical genetic analysis of quantitative character expression and methods for obtaining maximum efficiency in plant breeding schemes. Offered in alternate years.

***224. Chromosome Evolution** (3) I. Dvorak
Lecture—3 hours. Prerequisite: Genetics 201A and 201B or the equivalent. Structure and function of chromosomes. Dynamics of their evolution at the molecular and structural levels. Offered in alternate years.

***232. Advanced Topics in the Physiology of Crop and Range Plants** (3) III. The Staff
Lecture—3 hours. Prerequisite: Botany 111 or Plant Science 102. Physiological aspects of vegetative and reproductive growth of field crop and range plants in relation to nitrogen utilization and photosynthesis.

***234. Physiology of Crop Growth and Development** (3) I. Jernstedt

Lecture—3 hours. Prerequisite: Plant Biology 111, 112 or the equivalent. Selected aspects of plant growth and development as they relate to crop productivity. Analysis of current literature on shoot and root growth and function, reproduction, senescence, hormonal and environmental controls of development. Offered in alternate years.

290. Seminar in Crop Growth, Production and Utilization (1-2) I. Goyal

Seminar—1-2 hours. Topics of current interest related to plant growth processes, production and management systems, and utilization of cultivated food, feed and fiber crops.

291. Seminar in Plant Breeding and Evolution of Cultivated Plants (1-2) III. The Staff

Seminar—1-2 hours. Topics of current interest related to plant breeding systems and the origins and evolution of cultivated plants.

297T. Tutoring in Agronomy (1-5) I, II, III. The Staff (Chairperson in charge)

Tutoring—1-5 hours. Prerequisite: graduate standing; consent of instructor; and course to be tutored or the equivalent. Designed for graduate students who desire teaching experience but are not teaching assistants. May be repeated for credit for a total of 5 units. Same course may not be tutored more than one time. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Agronomy and Range Science

(College of Agricultural and Environmental Sciences)
Calvin O. Qualset, Ph.D., Chairperson of the Department

Department Office, 132 Hunt Hall (916-752-1703)

Faculty

Ivan W. Buddenhagen, Ph.D., Professor
Montague W. Demment, Ph.D., Associate Professor
R. Ford Denison, Ph.D., Associate Professor
Jan Dvorak, Ph.D., Professor
Shu Geng, Ph.D., Professor
Melvin R. George, Ph.D., Lecturer
Paul L. Gepts, Ph.D., Associate Professor
James E. Hill, Ph.D., Lecturer
Ray C. Huffaker, Ph.D., Professor
Leland F. Jackson, Ph.D., Lecturer
Subodh K. Jain, Ph.D., Professor
Judy A. Jernstedt, Ph.D., Associate Professor
Stephen R. Kaffka, Ph.D., Lecturer
James G. Leising, Ph.D., Lecturer, Supervisor of Teacher Education
John W. Menke, Ph.D., Professor
Donald A. Phillips, Ph.D., Professor
Richard E. Plant, Ph.D., Professor
Calvin O. Qualset, Ph.D., Professor
D. William Rains, Ph.D., Professor
Kevin J. Rice, Ph.D., Assistant Professor
Steven R. Temple, Ph.D., Lecturer
Larry R. Teuber, Ph.D., Associate Professor

Robert L. Travis, Ph.D., Professor
Thea A. Wilkins, Ph.D., Assistant Professor

Emeriti Faculty

Robert W. Allard, Ph.D., Professor Emeritus
R. William Breidenbach, Ph.D., Lecturer Emeritus
Beecher Crampton, M.S., Lecturer Emeritus
Horton M. Laude, Ph.D., Professor Emeritus
William M. Longhurst, Ph.D., Professor Emeritus
Robert S. Loomis, Ph.D., Professor Emeritus
R. Merton Love, Ph.D., Professor Emeritus
Duane S. Mikkelsen, Ph.D., Professor Emeritus
Maurice L. Peterson, Ph.D., Professor Emeritus
Y. P. Puri, Ph.D., Lecturer Emeritus
Charles A. Raguse, Ph.D., Professor Emeritus
Charles W. Schaller, Ph.D., Professor Emeritus
Raymond C. Valentine, Ph.D., Professor Emeritus
Barbara D. Webster, Ph.D., Professor Emeritus
William A. Williams, Ph.D., Professor Emeritus

Courses. See the Agricultural Systems and Environment, Agricultural Education, Agronomy, Plant Science, and the Range Science course listings.

American Studies

(College of Letters and Science)

David Scofield Wilson, Ph.D., Program Director
Program Office, 816 Sproul Hall (916-752-3377)

Committee in Charge

Michael Kramer, Ph.D. (*English*), Chairperson
Ruth Frankenberg, Ph.D. (*American Studies*)
Susan Kaiser, Ph.D. (*Textiles and Clothing*)
Lyn Lofland, Ph.D. (*Sociology*)
Jay Mechling, Ph.D. (*American Studies*)
Michael Smith, Ph.D. (*History*)
Patricia Turner, Ph.D. (*African American Studies, American Studies*)
David Van Leer, Ph.D. (*English*)
David Scofield Wilson, Ph.D. (*American Studies*)

Faculty

Ruth Frankenberg, Ph.D., Assistant Professor
Jay Mechling, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*
Patricia Turner, Ph.D., Associate Professor
David Scofield Wilson, Ph.D., Senior Lecturer

The Major Program

American Studies offers an alternative approach to the study of American experience for students who feel too limited by departmental approaches. Lower division, introductory classes explore the ways in which cultural systems shape and reflect life in the United States. These classes pay close attention to the ways in which differences of class, race, gender, generation, ethnicity, religion, and sexual orientation unevenly affect American lives.

The Program. American Studies majors take five upper division, in-depth classes (see below) and participate in three smaller proseminars limited to majors and devoted to close study of major thinkers and of issues crucial to the practice of American Studies. Advanced work in at least two other departments or programs allows each student to emphasize a period, a problem, or a subject tailored to his or her own individual education goals. Students have the option of writing a senior thesis within this emphasis.

Career Alternatives. As an interdisciplinary program, American Studies provides a good liberal arts and sciences undergraduate education. American Studies maximizes a student's contact with a variety of subject matter and approaches. This flexibility has meant that our graduates have been able to move into a broad range of career settings, including journalism, law, medicine, nursing, law enforcement, environmental planning, teaching, library science, museum curatorship, and business. Some students discover new

career possibilities through their internships in American institutions.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter24

- One course from American Studies 1 series...4
 One course from African American Studies 10, Asian American Studies 1, Chicano Studies 10 or 20, Native American Studies 10, or Women's Studies 504
 Two courses chosen from History 17A, 17B, 17C, 72A, 72B8
 One course chosen from English 30A, 30B ...4
 One course chosen from Anthropology 2, Sociology 24

Depth Subject Matter46

- American Studies core courses12
 American Studies 110, 120, and 130
 American Cultural Themes8
 Choose any two courses from the 150 series
 Three Junior Proseminars6
 (American Studies 180)
 Emphasis20
 In consultation with an American Studies adviser, the student designs a program of 20 units of upper division course work around a unifying theme, period, or subject matter in American civilization. The course work should come from at least two disciplines. The student may choose the **senior thesis option** (190A-190B) for 8 of these 20 units.

Total Units for the Major70

Recommended

Completion of the College requirement in English composition before enrollment in American Studies 190A.

Minor Program Requirements:

UNITS

American Studies20

- American Studies, upper division courses 20
 No more than 8 units of course 192 may be counted toward this total.

Faculty Advisers. J. Mechling, D. S. Wilson.

Teaching Credential Subject Representative. J. Mechling. See also the Teacher Education Program.

Courses in American Studies (AMS)

Lower Division Courses

*1A. Technology, Science, and American Culture

(4) I. Mechling

Lecture—3 hours; discussion—1 hour. American science and technology as cultural systems, mutual influence and interaction of those systems with other cultural systems, including religion, social thought, art, architecture, literature, music, and common sense. General Education credit: Contemporary Societies.

1B. Religion in American Lives (4) I. Mechling

Lecture—2 hours; discussion—1 hour; tutorials and field exercises. Examines ways Americans have ordered their lives with religion; how latter-day churches, imported faiths, and Indian cultures differ or converge; attention to "civil religion" and mass-media evangelism; genres of religious experience, such as testimony, song, dance, ritual, meditation, vision, trance. General Education credit: Civilization and Culture.

1C. American Lives through Autobiography (4) II, III. Frankenberg

Lecture—2 hours; discussion—2 hours. American culture as understood through the individual life stories told by Americans, with attention to the roles of gender, race, ethnicity, social class, and sexual orientation in the individual's life course.

1E. Nature and Culture in America (4) III. Wilson
 Lecture—3 hours; fieldwork—3 hours. Uses and abuses of nature in America; patterns of inhabitation, exploitation, appreciation, and neglect; attention to California; emphasis on metaphor as a key to understanding ourselves and the natural world; attention to models of healing: stewardship, ecology, the "rights" movement. Offered in alternate years. General Education credit: Civilization and Culture.

*1F. The Popular Image of Women in America (4) II. The Staff

Lecture—2 hours; discussion—1 hour; directed analysis of popular media. Lecture; media exposure; special projects. Examines the image of women as presented in popular media. Emphasis on the politics of gender roles and the connection between the popular feminine image and the demands of the larger American culture.

***2. Forms of American Wisdom (2) III. Mechling**
 Lecture—1 hour; discussion—1 hour. Exploration of the forms wisdom takes in America: folk knowledge; popular belief, prophetic wisdom, public religion, common sense, science, literature; special attention to the grounding of wisdom in circumstance of race, gender, generation, ethnic identity, and region. (P/NP grading only.)

*4. Freshman Seminar (2) II, III. The Staff (Program Director in charge)

Seminar—2 hours. Prerequisite: open only to students who have completed fewer than 40 quarter units. Investigation of a special topic in American Studies through shared readings, discussions, written assignments, and special activities (such as fieldwork, site visits). Emphasis on student participation in learning. Limited enrollment.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in Charge)

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

99. Individual Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses

*101A-H. Special Topics (4) I, II, III. The Staff (Chairperson in charge)

Seminar—3 hours, intensive reading, writing, and special projects. Interdisciplinary group study of special topics in American Culture Studies, designed for non-majors as well as majors. Content will vary according to the instructor and in accord with the following titles: (A) Popular Culture Studies; (B) Women's Studies; (C) Material Aspects of American Culture; (D) American National Character; (E) American Lives Through Autobiography; (F) The Interrelationship Between Arts and Ideas; (G) New Directions in American Culture Studies; (H) Problems in Cross-Cultural American Studies. May be repeated for credit in different subject area only.

110. A Decade in American Civilization (4) I. The Staff

Lecture—2 hours; discussion—2 hours. Prerequisite: one course of American Studies 1A, 1B, 1C, 1D, 1E or 1F. Close examination of a single decade in American civilization; the connections between the history, literature, arts, customs, and ideas of Americans living in the decade.

120. American Folklore and Folklife (4) II. Mechling

Lecture—3 hours; fieldwork—1 hour. Theory and method of the study of American folk traditions, including oral lore, customs, music, and material folk culture; the uses and meanings of those traditions in various folk communities, including families, ethnic institutions, voluntary organizations, and occupational groups. General Education credit: Contemporary Societies.

*125. Corporate Cultures (4) III. Hagerty

Lecture—2 hours; discussion—1 hour; fieldwork—1 hour. Prerequisite: one course chosen from course 120, Anthropology 2, Psychology 16, or Sociology 1; or consent of instructor. Exploration of the small group cultures of American corporate workplaces, includ-

ing the role of environment, stories, jokes, rituals, ceremonies, personal style, and play. The effects of cultural diversity upon corporate cultures, both from within and in contact with foreign corporations.

130. American Popular Culture (4) III. The Staff
 Lecture/discussion—3 hours; fieldwork—1 hour. Prerequisite: course 1 or upper division standing. American popular expression and experience as a cultural system, and the relationship between this system and elite and folk cultures. Exploration of theories and methods for discovering and interpreting patterns of meaning in American popular culture. General Education credit: Contemporary Societies.

*151. American Landscapes and Places (4) II. Wilson

Lecture—2 hours; discussion—1 hour; fieldwork—3 hours. Prerequisite: course 1 or upper division standing. Comparative study of several American cultural populations inhabiting a region, including their relationship to a shared biological, physical, and social environment, their intercultural relations, and their relationships to the dominant American popular and elite culture and folk traditions.

152. The Lives of Children in America (4) I. Mechling

Lecture—2 hours; discussion—2 hours. Experience of childhood and adolescence in American culture, as understood through historical, literary, artistic, and social scientific approaches.

153. The Individual and Community in America (4) II. Frankenberg

Lecture—2 hours; discussion—2 hours. Interdisciplinary examination of past and present tensions between the individual and the community in American experience, as those tensions are expressed in such cultural systems as folklore, public ritual, popular entertainment, literature, fine arts, architecture, and social thought.

154. The Lives of Men in America (4) III. Mechling
 Lecture—2 hours; discussion—2 hours. Interdisciplinary examination of the lives of boys and men in America, toward understanding cultural definitions of masculinity, the ways individuals have accepted or resisted these definitions, and the broader consequences of the struggle over the social construction of gender.

*155. Symbols and Rituals in American Life (4) II. Wilson

Lecture—2 hours; discussion—2 hours. Prerequisite: course 1. Interdisciplinary examination of selected, richly expressive events (parades, festivals, holidays) and symbols (flags, memorials, temples) which encode nationwide values and understandings (Thanksgiving, New Year's, etc.) or which realize more limited, special meanings (Mardi Gras, rodeo, Kwanza, graduation, bar mitzvah, etc.). Offered in alternate years.

156. Race, Culture and Society in the United States (4) I. Frankenberg

Lecture—2 hours; discussion—2 hours. Prerequisite: course 1. Interdisciplinary examination of the significance of race in the making of America; how race shapes culture, identities and social processes in the United States; the interweaving of race with gender, class and nationhood in self and community.

180. Junior Proseminar (2) I, II, III. Mechling, Turner, Frankenberg, Wilson

Discussion—2 hours. Prerequisite: junior standing in American Studies major. A small-group, intensive study of works frequently cited in American Studies scholarship; emphasis on theory and its application to American materials. May be repeated for credit with consent of instructor.

190A-190B. Senior Thesis (4-4) I, II, III. Mechling, Turner, Wilson, Frankenberg

Seminar—2 hours; independent study—2 hours. Prerequisite: senior standing in American Studies major. In consultation with adviser, student contracts to write an extended research paper on a topic mutually agreed upon and enunciated in a prospectus reviewed and accepted by faculty. (Deferred grading only, pending completion of sequence.)

192. Internship in American Institutions (1-12) I, II, III. The Staff (Chairperson in charge)
 Internship—1-12 hours. Prerequisite: enrollment dependent on availability of intern positions, with priority to American Studies majors. Supervised internship and study within and about key organizations in American civilization at archives, museums, schools, historical societies, governmental and social agencies, etc., with attention to the techniques of participant observation and the collection of ethnographical data. May be repeated for credit for a total of 12 units. (P/NP grading only.)

197T. Tutoring in American Studies (1-5) I, II, III. The Staff (Chairperson in charge)
 Tutorial—1-5 hours. Prerequisite: consent of Chairperson of American Studies Program. Tutoring in lower division American Studies courses, usually in small discussion groups. Periodic meetings with the instructor in charge; reports and readings. May be repeated for credit when the tutoring is for a different course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor and Chairperson of American Studies Program. (P/NP grading only)

Graduate Courses

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (S/U grading only.)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (S/U grading only.)

Anatomy

See **Anatomy, Physiology and Cell Biology (Veterinary Medicine, below); Cell Biology and Human Anatomy (Medicine, School of)**

Anatomy, Physiology, and Cell Biology

(School of Veterinary Medicine)

Dallas M. Hyde, Ph.D., Chairperson of the Department

Department Office, 1321 Haring Hall (916-752-1174)

Faculty

Hilary P. Benton, Ph.D., Assistant Professor
 Michael L. Bruss, D.V.M., Ph.D., Professor
 George H. Cardinet III, D.V.M., Ph.D., Professor
 Sharon L. Cummings, Ph.D., Assistant Professor
 Donald L. Curry, Ph.D., Professor
 Leslie J. Faulkin, Jr., Ph.D., Professor
 Dorothy W. Gietzen, Ph.D., Associate Professor
 Benjamin L. Hart, D.V.M., Ph.D., Professor
 Dallas M. Hyde, Ph.D., Professor
 Kent Pinkerton, Ph.D., Associate Professor in Residence
 Charles G. Plopper, Ph.D., Professor
 Susan M. Stover, D.V.M., Ph.D., Associate Professor
 Fern Tablin, V.M.D., Ph.D., Associate Professor
 William Thurlbeck, M.D., Adjunct Professor
 Reen Wu, Ph.D., Professor in Residence

Emeriti Faculty

Alfred A. Heusner, Docteur-es-Sciences, Professor Emeritus

Ralph L. Kitchell, D.V.M., Ph.D., V.M.D. (hc), Professor Emeritus, *Academic Senate Distinguished Teaching Award*

Walter S. Tyler, D.V.M., Ph.D., Professor Emeritus

Courses in Anatomy, Physiology, and Cell Biology (APC)

Upper Division Courses

100. Comparative Organology of Vertebrates (4) II. Plopper
 Lecture—3 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1B. Integrative study of the organization of cells and tissues into organs and organ systems in vertebrates. The following organ systems will be compared between fish, birds, and mammals: musculoskeletal, gastrointestinal, cardiovascular, respiratory, integumentary, urinary, reproductive, and nervous.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

202. Organology (2) II. The Staff (Chairperson in charge)
 Lecture—2 hours. Prerequisite: course 100 or the equivalent and consent of instructor. Comparative development, growth patterns, and composition of selected organs: liver, kidney, lung, mammary gland, brain, and a skeletal muscle. Offered in alternate years.

205. Ultramicroscopic Anatomy (3) III. The Staff (Chairperson in charge)
 Lecture—3 hours. Prerequisite: histology. The electron microscopic appearance of cells, tissues, and organs of animals emphasizing the structural basis for their physiological functions. Offered in alternate years.

207. Perspectives in Morphological Research (3) III. The Staff (Wu, Tablin in charge)
 Lecture—2 hours; discussion—1 hour. Consideration of the principles and applications of modern morphological methods and their role in biomedical research. Examples of specific methods include stereology, computer analysis of images, scanning and transmission electron microscopy, histochemistry, autoradiography, rapid freezing, and vascular injections. Offered in alternate years.

215. Veterinary Histology (6) II. The Staff (Chairperson in charge)
 Lecture—3 hours; laboratory—9 hours. Prerequisite: Biological Sciences 1B. The microscopic anatomy of tissues and organs of mammalian and avian species of veterinary significance.

220. Physiology of the Liver (3) I. Bruss
 Lecture—2.6 hours; laboratory—1.2 hours. Prerequisite: systemic physiology; biochemistry or physiological chemistry; or consent of instructor. Topics in functional morphology, physiology, intermediary metabolism, pharmacology, and disorders of the liver. Emphasis on bile formation; bile pigments; bile acids; drug and toxin metabolism; circulation; carbohydrate, lipid and protein metabolism; ion transport; and function tests.

225. Comparative Neural Function in Domestic Animals (2) III. Gietzen
 Lecture—1 hour; discussion—1 hour. Prerequisite: Biological Sciences 1B or the equivalent, and Psychology 108 or Veterinary Medicine 421 or the equivalent. Basic function of several neural systems will be described, using a general model. Discussions will cover species differences for each system. Mammals, birds, and amphibians that are commonly kept as companion or production animals will be compared. (Same course as 425.)

230. The Secretory Process (2) I. Curry
 Lecture—2 hours. Prerequisite: graduate standing or consent of instructor. Structural and intracellular

events involved in secretion with emphasis on physiological initiators and modifiers. All secretory systems, but emphasis on the beta cell of the endocrine pancreas as role model. Offered in alternate years.

238. Behavioral Adaptations to Parasites and Pathogens (3) II. Hart
 Lecture—2 hours; term paper/discussion—1 hour. Prerequisite: Veterinary Medicine 406; or graduate standing and upper division course in animal behavior; or consent of instructor. Examination of the ways in which animals use behavioral strategies to avoid debilitating viral, bacterial and parasitic diseases, or to overcome such diseases once they are sick. Main emphasis is on vertebrates, especially wild and domestic mammals.

283. Tumor Biology (3) I. The Staff (Chairperson in charge)
 Lecture—3 hours. Prerequisite: graduate standing and consent of instructor. Growth, invasion and metastasis of tumors; mechanisms of carcinogenesis; intrinsic and extrinsic etiologic factors. Offered in alternate years.

284. Ruminant Nutrition and Physiology (3) III. Bruss, Morris
 Lecture—2.7 hours; laboratory—0.9 hours. Prerequisite: graduate or veterinary student standing. Upper division nutrition courses (e.g., Nutrition 110), upper division systemic physiology (e.g., Neurobiology, Physiology and Behavior 110), Biochemistry (e.g., Biological Sciences 102 and 103) or physiological chemistry (e.g., Physiological Chemistry 101A and 101B) or equivalent. Basic and applied aspects of ruminant nutrition and physiology, nutritional and metabolic disorders of ruminants.

285. Morphometry of Cells, Tissues and Organs (2) III. Hyde
 Lecture—1 hour; laboratory—3 hours. Prerequisite: course 100 or the equivalent, and Statistics 13. At the end of the course, students will be able to define what critical data need to be collected to estimate volumes, surfaces and lengths of organs and their components (e.g., vessels, ducts and airways). Students will also learn how to estimate the number of cells in an organ or tissue, their volumes, products and gene expression using morphometry. Offered in alternate years.

291. Topics in Biology of Respiratory System (1) I, II, III. Tyler, Hyde, Plopper, Wu, Pinkerton
 Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Topics concerning structure and function of respiratory system. Possible topics include: lung growth, pulmonary reaction to toxicants, pulmonary inflammation, lung metabolism, biology of lung cells, tracheobronchial epithelium, nasal cavity structure and function. May be repeated for credit. (S/U grading only.)

292. Topics in Neuroscience Research (1) III. Cummings
 Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Students will examine current topics in neuroscience research literature, as well as evaluate rationale, methods, results, interpretation of data, and relevance of studies. Possible topics include pain, autonomic nervous system, neuroendocrinology, neurotransmitter regulation of gene expression, neuroendocrine-immune interactions, stress. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
 Laboratory—6-15 hours. Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
 Laboratory—6-36 hours. Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

425. Comparative Neural Function in Domestic Animals (2) III. Gietzen
 Lecture—1 hour; discussion—1 hour. Prerequisite: Biological Sciences 1B or the equivalent, and Psychology 108 or Veterinary Medicine 421 or the equivalent. Basic function of several neural systems will be described, using a general model. Discussions will

cover species differences for each system. Mammals, birds, and amphibians that are commonly kept as companion or production animals will be compared. (Same course as 225.)

443. Behavior Clinic (2) I, II, III. Hart

Laboratory—3 hours; discussion—2 hours. Prerequisite: second year standing in the School of Veterinary Medicine and course 458. Clinical training in behavioral therapy. Students work with clients and animal patients through the Behavioral Services Outpatient Clinic. Case record work-ups with selected presentations of cases during discussion sessions.

458. Behavioral Therapy (1) III. Hart

Lecture—1 hour. Prerequisite: first-year standing in the School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. Clinical application of management, conditioning procedures, hormonal manipulation and drug therapy to resolve common behavioral problems of dogs and cats.

Anesthesiology

See Medicine, School of

Animal Behavior (A Graduate Group)

Benjamin L. Hart, D.V.M., Ph.D., Chairperson of the Group

Group Office, 1064 Haring Hall (Animal Behavior Program) (916-752-4863; FAX: 916-752-8391)

Faculty. The Group includes faculty from eleven departments in three schools and colleges.

Graduate Study. The Ph.D. program in Animal Behavior is an interdepartmental program which trains students for teaching and research in a variety of areas including psychology, zoology, animal science, veterinary science, ecology, and wildlife biology. Students choose one of the three areas of specialization: (1) ethology and evolutionary bases of animal behavior, (2) physiological basis of animal behavior, and (3) applied animal behavior. All three specializations emphasize the adaptive and evolutionary bases of animal behavior. Resources available to students, in addition to various departmental facilities, include those of the California Regional Primate Research Center, Bodega Bay Marine Biology Laboratory, and the Agricultural Field Stations.

There is an early application deadline of January 15 for fall quarter.

Preparation. Appropriate preparation is a bachelor's or master's degree in one of the several disciplines relevant to behavior, such as psychology, zoology, entomology, anthropology, physiology, wildlife biology, ecology, animal science, veterinary medicine, genetics, or animal behavior. In addition, at least one course from each of the following four areas must be taken before admission into the program or before the end of the first year in the program.

General genetics: Genetics 100 or the equivalent
Statistics: Statistics 102 or Psychology 103, or the equivalent

Evolution: Genetics 103 or Evolution and Ecology 100, or the equivalent

Animal behavior: Psychology 150, Wildlife and Fisheries Biology 140, or Neurobiology, Physiology and Behavior 155, or the equivalent

Students are encouraged to engage in some form of research as early as possible during the first year. This pre-dissertation research may be pursued under the guidance of any faculty member of the Group, not necessarily the student's major professor.

Breadth Requirement. The following core courses or the equivalent (22 to 24 units) are required of all students.

Systemic physiology: Neurobiology, Physiology and Behavior 110 or 142

Statistical analysis: one course from Psychology 206, 207, Statistics 106, or 110

Scientific approaches to animal behavior research: Animal Behavior 201

Seminar in animal behavior: Animal Behavior 290

Ecology: Entomology 104, Environmental Studies 100, or Evolution and Ecology 101

College teaching: Biological Sciences 310 or Psychology 390

Comparative psychology: Psychology 250

Specialization. In addition to the requirements listed above, students must also take courses in one of the three areas of specialization with substitution as approved by the adviser.

Courses in Animal Behavior (ANB)

Graduate Courses

*201. Scientific Approaches to Animal Behavior

Research (3) I. The Staff

Lecture—3 hours. Prerequisite: consent of instructor. Philosophical issues, goals, strategies and tools in field and laboratory research. May be repeated for credit when topics differ. Offered in alternate years.

220. Behavioral Aspects of Animal Domestication (3) III. Price (Animal Science)

Lecture—3 hours. Prerequisite: graduate standing and a course in animal behavior, or consent of instructor. History of animal domestication, the role of natural and artificial selection in domestication, the influence of environment and experience on domestic animal behavior and human-animal interrelations. Offered in alternate years.

230A. Interdisciplinary Approaches to Animal

Behavior (3) II. The Staff

Seminar—3 hours; term paper. Prerequisite: consent of instructor. Analysis of literature in behavior and an allied discipline or disciplines that offer the potential, in combination, to advance the understanding of a topic in animal behavior conceptually and empirically. Topics will vary from year to year.

230B. Interdisciplinary Approaches to Animal

Behavior (5) III. The Staff

Workshop—4 days total; discussion—3 hours; term paper. Prerequisite: course 230A the previous quarter. Development of an empirical or theoretical interdisciplinary approach to research on a current topic in animal behavior.

290. Seminar in Animal Behavior (1-3) I, II, III. The Staff

Seminar—1-3 hours. Prerequisite: consent of instructor. Selected topics in animal behavior. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff

Prerequisite: graduate standing and consent of instructor.

299. Research (1-12) I, II, III. The Staff

Prerequisite: and consent of instructor. (S/U grading only.)

Animal Genetics

(College of Agricultural and Environmental Sciences)

Faculty. See under Department of Animal Science.

Major Program. See the major in Genetics.

Related Courses. See Agronomy 221, 222, 223; Plant Pathology 215; Plant Science 113; Vegetable Crops 220.

Courses in Animal Genetics (ANG)

Questions pertaining to the following courses should be directed to the instructor or to the Animal Science Advising Center, 1202 Meyer Hall.

Upper Division Courses

107. Genetics and Animal Breeding (5) III. Medrano
Lecture—4 hours; laboratory—3 hours. Prerequisite: Biological Sciences 101. Principles of quantitative genetics applied to improvement of livestock and poultry. Effects of mating systems and selection methods are emphasized with illustration from current breeding practices.

108. Methods in Quantitative Animal Breeding (3) II. Famula

Lecture—3 hours. Prerequisite: course 107. Methods and procedures in quantitative animal breeding, including: expected value, single and multiple trait selection index, restricted selection, embedded traits, categorical traits, and best linear unbiased prediction.

109. Introduction to Parameter Estimation (1) II. Famula

Lecture—1 hour. Prerequisite: course 107 or the equivalent; course 108 recommended. Procedures for estimation of repeatability, heritability, and genetic and environmental correlations. Concept of expected value, estimation of variance components and the simulation of biological data.

111. Molecular Biology Laboratory Techniques (4) II. Murray, Oberbauer

Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1C; Biological Sciences 101, 102, 103. Introduction to the concepts and techniques used in molecular biology; the role of this technology in both basic and applied animal research, and participation in laboratories using some of the most common techniques in molecular biology.

198. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge)
Prerequisite: consent of instructor. Selected topics relating to animal genetics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates

(1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

204. Theory of Quantitative Genetics (3) I. Gall
Lecture—3 hours. Prerequisite: course 107 or the equivalent. Theoretical basis of quantitative genetics and the consequences of Mendelian inheritance. Concepts used to estimate quantitative genetic differences and basis for partitioning the phenotypic variance. Offered in alternate years.

*206. Advanced Domestic Animal Breeding (3) III. Famula

Lecture—3 hours. Prerequisite: course 107 and Animal Science 205; course 204 recommended. Procedures for the genetic evaluation of individuals to include selection indices and mixed model evaluation for single and multiple traits. Methods of estimating genetic trends. Offered in alternate years.

*208. Estimation of Genetic Parameters (3) III. The Staff (Animal Science)

Lecture—3 hours. Prerequisite: course 107 and Animal Science 205; courses 204 and 108 recommended. General methods for the estimation of components of variance and covariance and their application to the estimation of heritability, repeatability and genetic correlations are considered. Spe-

cific emphasis is given to procedures applicable to livestock populations under selection.

211. Genetic Engineering of Animals (2) III. Murray Lecture—1 hour; lecture/discussion—1 hour. Review of techniques for the genetic engineering of animals and their limitations and applications. Student-led discussions of recent papers in the field and possible future applications of genetically engineered animals in basic research and applied agricultural and medical research. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Lectures and discussions of advanced topics in animal genetics. (S/U grading only.)

299. Research in Animal Genetics (1-12) I, II, III. The Staff (Bradford in charge)
(S/U grading only.)

Animal Physiology

See Biological Sciences: Section of Neurobiology, Physiology and Behavior

Animal Science

(College of Agricultural and Environmental Sciences)

Edward O. Price, Ph.D., Chairperson of the Department

James D. Murray, Ph.D., Vice Chairperson of the Department

Department Office, 2223 Meyer Hall (916-752-1250)
Bodega Marine Laboratory (BML)
Bodega Bay, CA (707-875-2211)

Faculty

Thomas E. Adams, Ph.D., Professor
Gary B. Anderson, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*
R. Leland Baldwin, Jr., Ph.D., SESNON Professor of Animal Science

Patricia J. Berger, Ph.D., Associate Professor
C. Christopher Calvert, Ph.D., Professor
Ernest S. Chang, Ph.D., Professor (*Biological Sciences, Bodega Marine Laboratory*)
Douglas E. Conklin, Ph.D., Associate Professor
Fred S. Conte, Ph.D., Lecturer
Edward J. DePeters, Ph.D., Professor
Serge Doroshov, Ph.D., Professor
James G. Fadel, Ph.D., Associate Professor
Thomas R. Famula, Ph.D., Associate Professor
Graham A. E. Gall, Ph.D., Professor
Ian Garnett, Ph.D., Senior Lecturer
Dennis Hedgecock, Ph.D., Lecturer (*Bodega Marine Laboratory*)

Silas S. O. Hung, Ph.D., Associate Professor
Yu-Bang Lee, Ph.D., Professor
Joan M. Macy, Ph.D., Professor
Juan F. Medrano, Ph.D., Associate Professor
Gary P. Moberg, Ph.D., Professor
James D. Murray, Ph.D., Associate Professor
Anita M. Oberbauer, Ph.D., Assistant Professor
James W. Oltjen, Ph.D., Lecturer
Edward O. Price, Ph.D., Professor
Janet F. Roser, Ph.D., Associate Professor
Roberto D. Sainz, Ph.D., Assistant Professor
Richard A. Zinn, Ph.D., Professor

Emeriti Faculty

C. Robert Ashmore, Ph.D., Professor Emeritus
G. Eric Bradford, Ph.D., Professor Emeritus
Floyd D. Carroll, Ph.D., Professor Emeritus
Wallis H. Clark, Jr., Ph.D., Professor Emeritus

Perry T. Cupps, Ph.D., Professor Emeritus
William N. Garrett, Ph.D., Professor Emeritus
Robert C. Laben, Ph.D., Professor Emeritus
Glen P. Lofgreen, Ph.D., Professor Emeritus
James H. Meyer, Ph.D., Professor Emeritus, Chancellor Emeritus
Wade C. Rollins, Ph.D., Professor Emeritus
Robert W. Touchberry, Ph.D., Professor Emeritus
William C. Weir, Ph.D., Professor Emeritus

The Major Program

The animal science major gives students an understanding of the proper care of animals and their utilization by people for food, fiber, work, research, companionship, and recreation. Aquaculture, companion animals, laboratory species, and domestic animal agriculture are included in animal science. The study of animals is achieved through biological, physical and social sciences, such as chemistry, biochemistry, genetics, physiology, nutrition, economics, mathematics, and their integration in the various animal science courses.

The Program. Two options are available in the major: *Animal Biology* and *Aquaculture*. The *Animal Biology* option is designed for students with interests in the biology of domestic animals, covering the range of study from the molecular and cellular levels to the whole animal and populations of animals. Course requirements emphasize domestic animal biology and production. Course requirements in the *Aquaculture* option emphasize biology and production of fresh- and saltwater aquatic animals. The *Aquaculture* option is appropriate for students interested in applying principles of animal production to aquatic species.

Internships and Career Alternatives. Career opportunities for graduates cover a wide range of options from farming and ranching to all of the industries, institutions, and professions involved with domestic animals and aquaculture. These include positions in management, sales, financial services, health care, agricultural extension, consulting services, teaching, journalism, laboratory technology, and research. Preparation for veterinary medicine or other professional schools or graduate study can be achieved by careful planning in the major.

B.S. Major Requirements:

	UNITS
Written/Oral Expression	7-8
See College requirement	7-8
Preparatory Subject Matter	55-56
Animal science (Animal Science 1, 2, and either 15 or 18 or 41 and 41L or 42).....	11-12
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Chemistry (Chemistry 2A, 2B, 8A, 8B).....	16
Computer science (Agricultural Systems and Environment 21).....	3
Mathematics (Mathematics 16A-16B or more advanced mathematics courses).....	6
Statistics (Agricultural Systems and Environment 120 or Statistics 102, or other courses in quantitative skills with prior approval of the master adviser).....	4
Breadth/General Education	6-24
Depth Subject Matter	23
Biological Sciences 101, 102, 103, 104.....	13
Animal Genetics 107	5
Nutrition 110	5
Areas of Specialization	35-41
Animal Biology option	
Physiology, Neurobiology, Physiology and Behavior 110	5
Laboratory, one course from the following: Animal Genetics 111, Animal Science 135, Microbiology 177L (Microbiology 177 must be taken concurrently), Molecular and Cellular Biology 120L, Veterinary Microbiology and Immunology 126L ..	2-6
Animal science (28 units minimum)	28
At least one course from the Animal Care and Management series: Animal Science	

115, 140, 143, 144, 146;
and the balance from Animal Science 102, 104, 105, 106, 118, 119, 120, 120L, 123, 124, 128, 131, 135 (if not elected above), 141, 145, 147, 148, Animal Genetics 108, 109, 111 (if not elected above), Microbiology 177, 177L (if not elected above), Nutrition 115, 122, 122L, 123, 124, Neurobiology, Physiology and Behavior 121, 121L, 130;
A maximum of two courses from the following list may be selected in consultation with your faculty adviser and used toward the 28-unit Animal Science requirement:
Wildlife and Fisheries Biology 121, 151, Epidemiology and Preventive Medicine 111, Molecular and Cellular Biology 150, 150L, Veterinary Microbiology and Immunology 126, Avian Science 100.

Aquaculture option

Physics 5A-5B or 1A-1B.....	6-8
Evolution and Ecology 112, 112L.....	7
Wildlife and Fisheries Biology 120.....	3
Nutrition 124	3
Neurobiology, Physiology and Behavior 142, or Biological Sciences 121 and 123, or Wildlife and Fisheries Biology 121	4
Animal Science 118 and 119	8
Animal Science.....	12

At least four (4) courses and at least 12 units including one laboratory course (designated with "P" or "L," or Animal Science 135 or Animal Genetics 111) from the following list:

Animal Science 102, 104, 123, 128, 131, 135, 148, Animal Genetics 108, 109, 111, Agricultural Engineering Technology 161A, 161B, Biological Sciences 120 and 123, 120P, 121P, Environmental Studies 151, 151L, Food Science and Technology 110B, 111, 151, Microbiology 177, 177L, Nutrition 122, 122L, 123, Neurobiology, Physiology and Behavior 110, 120D, 121, 130, Veterinary Medicine 416, Wildlife and Fisheries Biology 120L (does not meet laboratory requirement), 122, Molecular and Cellular Biology 150, 150L (does not meet laboratory requirement), 142.	
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Unrestricted Electives

Total Units for the Degree

Master Adviser. G.A.E. Gall.

Advising Center for the major is located in 1202 Meyer Hall. Students must secure their academic adviser through this office upon entering the major.

Graduate Study. The Department of Animal Science offers a program of study and research leading to the M.S. degree. In addition, the Master of Agriculture and Management (M.A.M.) is offered by the Department of Animal Science in conjunction with the Graduate School of Management. Detailed information about each of these programs may be obtained by contacting the department.

Graduate Adviser. T.R. Famula (M.S. degree); I. Garnett (M.A.M. degree).

Courses in Animal Science (ANS)

Lower Division Courses

1. Domestic Animals and People (4) I. Famula Lecture—3 hours; laboratory—3 hours. Animal domestication and factors affecting their characteristics and distribution. Animal use for food, fiber, work, drugs, research and recreation; present and future roles in society. Laboratory exercises with beef and dairy cattle, poultry, sheep, swine, laboratory animals, fish, horses, meat and dairy products. General Education credit: Nature and Environment.

2. Introductory Animal Science (4) III. Berger Lecture—3 hours; laboratory—3 hours. Prerequisite: course 1 and Biological Sciences 1A recommended.

Growth, reproduction, lactation, inheritance, nutrition, and disease control in domesticated animals and species used in aquaculture; the application of sciences to animal production. General Education credit: Nature and Environment.

15. Introductory Horse Husbandry (3) II. Roser
Lecture—3 hours. Prerequisite: course 2 recommended. Introduction to care and use of light horses emphasizing the basic principles for selection of horses, responsibilities of ownership, recreational use and raising of foals.

18. Introductory Aquaculture (4) III. Conklin
Lecture—3 hours; discussion—1 hour. Historical and contemporary aquacultural practices. Interaction between the aqueous culture environment and the biology of aquatic animals. Impact of economics and governmental policies on the development of aquaculture. Interaction of aquacultural practices with larger societal goals.

21. Livestock and Dairy Cattle Judging (2) III. Van Liew
Laboratory—6 hours. Prerequisite: course 1 or 2 recommended. Evaluation of type as presently applied to light horses, meat animals and dairy cattle. Relationship between form and function, form and carcass quality, and form and milk production.

22A-22B. Animal Judging (2-2) I-II. Van Liew
Laboratory—6 hours; weekend field trips. Prerequisite: course 21 or the equivalent. Study of individual and group classes of animals with emphasis on visual appraisal of conformation and its accurate description. Course is required for intercollegiate judging competition. (P/NP grading only.)

41. Domestic Animal Production (2) I. DePeters
Lecture—2 hours. Principles of farm animal management, including dairy and beef cattle, sheep, and swine. Industry trends, care and management, nutrition, and reproduction.

41L. Domestic Animal Production Laboratory (2) I. DePeters
Laboratory—6 hours. Prerequisite: course 41 (may be taken concurrently). Animal production principles and practices, including field trips to dairy cattle, beef cattle, sheep and swine operations, and campus laboratories. (P/NP grading only.)

42. Introductory Companion Animal Biology (4) II. Oberbauer
Lecture—3 hours; discussion—1 hour. Companion animal domestication. Historical, contemporary perspectives. Legislation concerning companion animals. Selected topics in anatomy, physiology, genetics, nutrition, behavior and management. Scientific methods in studying the human-animal bond. Discussions: application of biological concepts to problems related to companion animals. General Education credit: Nature and Environment.

49A-49B-49C. Animal Management Practices (2-2-2) I-II-III. The Staff
Discussion—1 hour; laboratory—3 hours. The application of the principles of elementary biology; the art and science of management of beef and dairy cattle, dairy goats, horses, sheep, swine, and laboratory animals. (P/NP grading only.)

92. Internship in Animal Science (1-12) I, II, III. The Staff (Department Chairperson in charge)
Internship—3-18 hours. Prerequisite: consent of instructor. Internship off and on campus in dairy, livestock, and aquaculture production, research and management; or in a business, industry, or agency associated with these or other animal enterprises. All requirements of Internship Approval Request form must be met. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

***102. Limited Resource Animal Agriculture** (4) III. Brown
Lecture—3 hours; laboratory—3 hours; one all-day Saturday field trip required. Prerequisite: course 2. Environmentally and economically sound methods are presented to meet objectives of limited resource animal agriculture systems. Range systems, small farms, Third World systems and suburban enterprises are considered. (Same course as International Agricultural Development 102.)

104. Principles of Domestic Animal Behavior (3) II. Price
Lecture—3 hours. Prerequisite: Biological Sciences 1A or 1B or the equivalent. Basic principles of animal behavior as applied to domesticated species. Emphasis will be placed on behavioral development and social behavior. External (exogenous) and physiological mechanisms influencing behavior will be discussed. Offered in alternate years. (Students who have received credit for Zoology 155 may receive only 2 units for this course.)

***105. Behavioral Adaptations of Domestic Animals** (2) II. Price
Lecture—2 hours. Prerequisite: course 104 or the equivalent. To provide an in-depth examination of the behavior of domestic animals and the role of behavior in management. Offered in alternate years.

***106. Domestic Animal Behavior Laboratory** (2) II. Price
Laboratory—6 hours. Prerequisite: course 104 or the equivalent. Research experience with the behavior of large domestic animals. Experimental design, methods of data collection and analysis, and reporting of experimental results.

115. Advanced Horse Production (4) I. Roser
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 15; Biological Sciences 101; Nutrition 110 or 115; Neurobiology, Physiology and Behavior 110; or consent of instructor. Feeding, breeding, and management of horses; application of the basic principles of animal science to problems of production of all types of horses. Designed for students who wish to become professionally involved in the horse industry.

118. Fish Production (4) II. Beer, Doroshov
Lecture—3 hours; discussion—1 hour. Prerequisite: Wildlife and Fisheries Biology 120 and 121. Current practices in fish production; relationship between the biological aspects of a species and the production systems, husbandry, management, and marketing practices utilized. Emphasis on species currently reared in California.

119. Invertebrate Aquaculture (4) I. Conklin, Conte
Lecture—3 hours; discussion—1 hour. Prerequisite: Evolution and Ecology 112 or Neurobiology, Physiology and Behavior 142, or the equivalent; Applied Biological Systems and Technology 161 recommended. Management, breeding and feeding of economically important aquatic invertebrates; application of basic principles of physiology, reproduction, and nutrition to production of mollusks and crustaceans for human food; emphasis on interaction of species biology and managerial techniques on production efficiencies.

120. Principles of Meat Science (3) III. Bandman (Food Science and Technology), Lee
Lecture—3 hours. Prerequisite: Biological Sciences 103, or the equivalent. Anatomical, physiological, developmental, and biochemical aspects of muscle underlying the conversion of muscle to meat. Includes meat processing, preservation, microbiology, and public health issues associated with meat products. (Same course as Food Science and Technology 120.)

120L. Meat Science Laboratory (2) III. Lee, Bandman (Food Science and Technology)
Discussion—1 hour; laboratory—3 hours. Prerequisite: Biological Sciences 103; course 120 (may be taken concurrently). Laboratory exercises and student participation in transformation of live animal to carcass and meat, structural and biochemical changes related to meat quality, chemical and sensory evaluation of meat, and field trips to packing plant and processing plant. (Same course as Food Science and Technology 120L.)

123. Animal Growth (4) III. Sainz, Oberbauer, Lee
Lecture—4 hours. Prerequisite: Biological Sciences 101, 103. Basic and practical aspects of prenatal and postnatal growth and development. Emphasis on genetic, hormonal, and biochemical control of meat protein accumulation.

124. Lactation (4) III. Baldwin
Lecture—3 hours; laboratory—3 hours. Prerequisite: Neurobiology, Physiology and Behavior 110; Nutrition 110; or the equivalent background knowledge. Consideration of the biochemical, genetic, physiological, nutritional, and structural factors relating to mammary gland development, the initiation of lactation, the composition of milk and lactational performance.

128. Linear Programming in Animal Agriculture (3) II. Fadel
Lecture—2 hours; laboratory—2 hours. Prerequisite: upper division standing; Nutrition 110, 115 or the equivalent; understanding of animal production, or consent of instructor. Linear programming in animal agriculture emphasizing farm planning and ration formulation. Provides experience in understanding, developing and applying linear programs.

131. Reproduction and Early Development in Aquatic Animals (4) III. Doroshov
Lecture—3 hours; laboratory—3 hours. Prerequisite: Molecular and Cellular Biology 150; Wildlife and Fisheries Biology 120, 121; or consent of instructor. Physiological and developmental functions related to reproduction, breeding efficiency and fertility of animals commonly used in aquaculture.

135. Experimental Biochemistry Laboratory (4) I. Calvert
Lecture—2 hours; laboratory—6 hours. Prerequisite: one course each in biochemistry and physiology; consent of instructor. Course designed to introduce student to concepts of research. Experience in research animal care, tissue sampling and handling techniques, a variety of commonly used laboratory analytical methods, cost analysis, literature review and publication writing are provided. (Not open to students who have received credit for Biochemistry 101L.)

140. Management of Laboratory Animals (4) I. Adams
Lecture—3 hours; laboratory—3 hours. Prerequisite: Animal Genetics 107; Nutrition 110 or 115; Neurobiology, Physiology and Behavior 110. Application of the concepts of nutrition, physiology, and genetics to maintenance of experimental animals. Management procedures will be examined in view of experimental needs, government regulations, and animal health.

141. Equine Enterprise Management (4) II. Roser/Garnett
Lecture/discussion—4 hours. Prerequisite: course 115; Economics 1A, 1B recommended. Examination of the concepts and principles involved in the operation of an equine enterprise. Essential aspects of equine enterprise management, including equine law, marketing, cash flow analysis and impact of state and federal regulations.

143. Pig and Poultry Care and Management (4) I. Garnett, Ernst, Berger
Lecture—3 hours; laboratory—3 hours; Saturday field trips. Prerequisite: Nutrition 115 or 110; Neurobiology, Physiology and Behavior 110. Care and management of swine, broilers and turkeys as related to environmental physiology, nutrition and metabolism, disease management and reproduction.

144. Beef Cattle and Sheep Production (4) I. Sainz
Lecture—3 hours; laboratory—3 hours; one or two Saturday field trips. Prerequisite: course 41, Animal Genetics 107, Nutrition 115, or consent of instructor; a course in Range Science and a course in microcomputing are recommended. Genetics, physiology, nutrition, economics and business in beef cattle and sheep production. Resources used, species differences, range and feedlot operations. Emphasis on integration and information needed in methods for management of livestock enterprises.

145. Meat Processing and Marketing (4) II. Lee
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 143 or 144 or consent of instructor. Distribu-

tion, processing and marketing of meat and meat products. Meat and meat animal grading and pricing. Government regulations and social/consumer concerns. Future trends and impact on production management practices. Includes poultry.

146. Dairy Cattle Production (4) III. DePeters
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 124, Animal Genetics 107, and Nutrition 115, or consent of instructor. Scientific principles from genetics, nutrition, physiology, and related fields applied to conversion of animal feed to human food through dairy animals. Management and economic decisions are related to animal biology considering the environment and animal well-being.

147. Dairy Processing and Marketing (3) II. The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 146 or consent of instructor. Examination of distribution systems, processing practices, product quality, impact of government policy (domestic and foreign), marketing alternatives; and product development.

148. Enterprise Analysis in Animal Industries (4) III. Garnett
Lecture/discussion—4 hours. Prerequisite: course 141 or 146 or 147 or consent of instructor. Examination and application of decision making and problem solving in the production enterprise. The areas of production analysis, problem solving, risk analysis and cost-benefit analysis will be examined in terms of the total enterprise.

190C. Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: advanced standing; consent of instructor. Weekly conference on research problems, progress and techniques in the animal sciences. May be repeated for credit. (P/NP grading only.)

192. Internship in Animal Science (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Internship off and on campus in dairy, livestock and aquaculture production, research and management; or in a business, industry, or agency associated with these or other animal enterprises. All requirements of Internship Approval Request Form must be met. (P/NP grading only.)

193. Introduction to Animal Science Research (1) I, II, III. Gall
Lecture/discussion—1 hour. Prerequisite: Biological Sciences 1A and 1B, course 2 and an upper division Animal Science course. Consideration of ethics in animal research; basic elements of a research plan, project design, and literature review; preparation of a research proposal. Mid-term report and preparation of a brief research proposal.

194. Research in Animal Science (3) I, II, III The Staff
Laboratory—6 hours; discussion—1 hour. Prerequisite: upper division standing, course 193, one laboratory course in animal biology and consent of instructor. Research with a faculty mentor. Weekly discussion and laboratory on specific research topic. May include a seminar to research group. Choose from sections: (1) Animal Behavior; (2) Animal Genetics; (3) Animal Nutrition; (4) Animal Physiology. May be repeated for credit for a total of four times.

194HA-194HB-194HC. Undergraduate Honors Thesis in Animal Science (4-4-4) I-II-III. The Staff (Chairperson in charge)
Lecture—1 hour; laboratory—9 hours. Prerequisite: Neurobiology, Physiology and Behavior 110, Biological Sciences 102, 103 and Nutrition 110; minimum cumulative GPA of 3.2 and selection by the Honors Selection Committee. Students will carry out a research project (chosen from faculty-suggested or approved proposals) during the academic year under the guidance of a faculty member. Upon completion, student will write a thesis and present a public seminar describing his/her research. (Deferred grading only, pending completion of sequence.)

195. Senior Project in Animal Science (3) I, II, III. The Staff
Studio—6 hours. Prerequisite: senior standing in animal science and consent of instructor. Project analysis of a specific area of animal science; industry, communication, outreach, business and marketing, animal welfare, food safety and research are examples. May be repeated for credit for a total of three times. Limited enrollment.

197T. Tutoring in Animal Science (1-2) I, II, III. The Staff (Chairperson in charge)
Tutoring—1-2 hours. Prerequisite: Animal Science or related major; advanced standing; consent of instructor. Tutoring of students in lower division animal science courses; weekly conference with instructors in charge of courses; written critiques of teaching procedures. May be repeated once for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)
199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge.)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200. Strategies in Animal Production (4) II. Garnett
Lecture/discussion—4 hours. Prerequisite: consent of instructor. Examines the forces and issues in animal agriculture through the strategic management process.

206. Models in Agriculture and Nutrition (3) II. Fadel
Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 16B; Statistics 108. Basic model building principles and techniques for statistical and systems simulation models. Optimization techniques for non-linear experimental designs and management models are presented. Quantitative analysis and evaluation of linear and non-linear equations used in agriculture and nutrition. Offered in alternate years.

***215. Advanced Concepts of Growth Regulation** (3) I. Oberbauer
Lecture—3 hours. Prerequisite: Biological Sciences 103 and 104; Molecular and Cellular Biology 102B and 141. Cellular and molecular mechanisms of growth regulation. Topics include cellular proliferation and differentiation in both tissue culture and animal models. Autocrine, paracrine, and transacting factors are discussed. Emphasis on critical reading and writing, including development of an optional research proposal.

216. Grant Writing Techniques (1) II. Oberbauer
Lecture—1 hour. Prerequisite: course 215. Introduction to the peer-reviewed grant writing process. Sources of funding, proposal description, budget calculations, and the review mechanism will be discussed. Proposals written in course 215 will be revised. (S/U grading only.)

***235. Advanced Techniques in Animal Nutrition Research** (2) I,II,III. The Staff (Calvert in charge)
Lecture—1 hour; laboratory—3 hours. Prerequisite: graduate standing and consent of instructor. Application of advanced laboratory techniques to animal nutrition research; use of mechanistic models for experimental design and data analyses; surgical preparations useful in nutrition research; review of current literature. May be repeated for credit when topics differ. (S/U grading only.)

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Reports and discussions of topics of interest in genetics, nutrition, and physiology as they apply to animal science. (S/U grading only.)

290C. Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: graduate standing. Weekly conference on research problems, progress and techniques in the animal sciences. May be repeated for credit. (S/U grading only.)

297. Supervised Teaching in Animal Science (2) I, II, III. The Staff (Chairperson in charge)
Supervised teaching—6 hours. Prerequisite: consent of instructor. Practical experience in teaching Animal

Science at the University level; curriculum design and evaluation; preparation and presentation of material. Assistance in laboratories, discussion sections, and evaluation of student work. An evaluation letter sent to the Graduate Adviser with a copy to the student. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (Sect. 1, 2; 3—letter grading; from Sect. 4 on—S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Animal Science and Management

(College of Agricultural and Environmental Sciences)

The Major Program

The animal science and management major combines a thorough education in the basic biology of domestic animal species with a strong background in managerial economics. Graduates of this program manage farms and participate in a wide variety of other businesses related to agriculture. Many graduates enter graduate, veterinary and medical schools, while others became teachers and extension personnel.

The Program. The interdisciplinary program in animal science and management is designed for students who want a fundamental background in the natural sciences (chemistry, biology, physiology, nutrition, genetics, mathematics, and behavior), as well as courses in economics and humanities. After completion of preparatory courses, students focus on both the animal species that interest them (horses, cattle, sheep, companion animals, goats, fish, crustaceans or mollusks, among others) and principles of managerial economics (marketing, finance, business organization or systems analysis).

Career Alternatives. Job opportunities for successful animal science and management graduates are plentiful. Banking and financial institutions, agribusiness, Peace Corps, farms of all scales, and related businesses are eager to interview graduates with this major. Most animal science and management graduates are well prepared for professional school (medical, law, veterinary, and graduate business schools) as well as graduate research programs leading to the M.S. or Ph.D. degrees. Advanced degrees open doors to work as extension specialists, farm advisers, school teachers, and prepare students for international service and a host of other fulfilling careers. Graduates of this interdisciplinary major will be well positioned to adjust to our rapidly changing world and job market.

B.S. Major Requirements:

For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal courses or more comprehensive courses on the same subjects are acceptable. Students preparing for medical or veterinary school can easily match professional entrance requirements with those of this major if they plan ahead.

	UNITS
English Composition Requirement	7-8
See College requirement	7-8
Preparatory Subject Matter	73-74
Animal science (Animal Science 1 and 2, and either 15 or 18 or 41 and 41L or 42	11-12
Biological sciences (Biological Sciences 1A, 1B, 1C)	15
Chemistry (Chemistry 2A, 2B, 8A, 8B)	16
Computer science (Agricultural Systems and Environment 21)	3

Economics (Economics 1A, 1B, Management 11A, 11B).....18
 Mathematics (Mathematics 16A-16B or the more advanced mathematics courses) .6
 Statistics (Agricultural Systems and Environment 120 or Statistics 102, or other courses in quantitative skills with prior approval of the Master Adviser).....4
Breadth/General Education Subject Matter ..6-24
Depth Subject Matter43-44
 Biological Sciences 1014
 Nutrition 1154
 Neurobiology, Physiology and Behavior 110.....5
 Business Management.....19-20
 Agricultural Economics 100A, 130, 140, Animal Science 128;
 Plus at least *one* course from:
 Agricultural Economics 18, 112, 113, 118A, 118B, 136, 145, 157, 171A, 171B.
 Production/Management/Processing/
 Marketing11
 At least *one* course from:
 Animal Science 115, 118, 119, 140, 143, 144, 146;
 At least *one* course from:
 Animal Science 141, 145, 147;
 and Animal Science 148.
Restricted Electives5-9
 At least two additional courses (minimum 5 units; duplicate from Depth courses not counted) selected with approval of adviser from:
 Animal Science 102, 104, 105, 106, 115, 118, 119, 120, 120L, 123, 124, 131, 135, 140, 141, 143, 144, 145, 146, 147, 148, 192, Avian Sciences 149, Animal Genetics 107, 108, 109, 111, Nutrition 122, 122L, 123, 124, Biological Sciences 102 (strongly recommended), Neurobiology, Physiology and Behavior 121, 121L, 130, Wildlife and Fisheries Biology 131.
Unrestricted Electives21-46
Total Units for the Degree180

Major Adviser. J.G. Fadel.

Upon entering the major, students should contact the Advising Center for assignment of a faculty adviser.

Advising Center for the major (including peer advising) is located in 1202 Meyer Hall (916-752-6118).

Anthropology

(College of Letters and Science)

Aram A. Yengoyan, Ph.D., Chairperson of the Department

Department Office, 330 Young Hall (916-752-0745/0746)

Faculty

John M. Beaton, Ph.D., Associate Professor
 Robert L. Bettinger, Ph.D., Professor
 Monique Borgerhoff-Mulder, Ph.D., Assistant Professor

David J. Boyd, Ph.D., Associate Professor
 Richard T. Curley, Ph.D., Lecturer
 William G. Davis, Ph.D., Professor
 Jack D. Forbes, Ph.D., Professor (*Anthropology, Native American Studies*)

Charles R. Hale, Ph.D., Assistant Professor
 Sarah B. Hrdy, Ph.D., Professor
 Suad Joseph, Ph.D., Professor
 Smadar Lavie, Ph.D., Assistant Professor (*Anthropology, Critical Theory*)

Martha J. Macri, Ph.D., Assistant Professor (*Anthropology, Native American Studies*)
 Henry M. McHenry, Ph.D., Professor

Peter S. Rodman, Ph.D., Professor
 G. William Skinner, Ph.D., Professor (*Anthropology, Center for Comparative Research*)
 Carol A. Smith, Ph.D., Professor
 David G. Smith, Ph.D., Professor
 Janet S. Smith, Ph.D., Associate Professor
 Carolyn F. Wall, Ph.D., Senior Lecturer
 John T. Walton, Ph.D., Professor (*Anthropology, Sociology*)
 Aram A. Yengoyan, Ph.D., Professor

Emeriti Faculty

Daniel J. Crowley, Ph.D., Professor Emeritus
 David L. Olmsted, Ph.D., Professor Emeritus
 Delbert L. True, Ph.D., Professor Emeritus

The Major Program

Anthropology is the systematic study of human beings as they live in groups. It is a diverse field and the courses at Davis are subdivided into four categories—biological, social/cultural, linguistics, and archaeology. The student of anthropology learns about human social life—past and present—and gains a broad understanding of humans and society.

The Program. Students interested in the scientific study of human origins, primate studies and the fundamentals of biology as these relate to *Homo sapiens* should enroll in the Bachelor of Science degree program. Students interested in ethnography and the ethnology of selected culture areas or linguistics (language in culture and society and linguistic field methods) should enroll in the Bachelor of Arts degree program. Students interested in archaeology (prehistory and the techniques and methods of archaeology) should consult an adviser before choosing one degree program or the other.

Career Alternatives. Although most practicing anthropologists teach in colleges and universities, a bachelor's degree in anthropology can lead to work in museums, in the Park Service, or in other aspects of public archaeology. A Bachelor of Science degree is a suitable major for premedical and pre dental preparation. A degree in anthropology with appropriate courses in education also can be good preparation for high school teaching in social sciences or natural sciences.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter24-39	
Anthropology 1, 2, 3, 4.....16	
Statistics 13.....4	
Geography 1 or Environmental Studies 30.....4	
Foreign language (15 units or the equivalent in one language).....0-15	
Depth Subject Matter40	
Anthropology 110, 128, 137, 170.....16	
Linguistic anthropology, one course.....4	
Biological anthropology, one course.....4	
Ethnography, one course.....4	
Archaeology, one additional course.....4	
An additional 8 units selected from the following: any upper division anthropology course, Art History 150, 151, Genetics 100.....8	
Total Units for the Major64-79	

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter55-56	
Anthropology 1, 2, 3.....12	
Biological Sciences 1A, 1B, 1C.....15	
Chemistry 2A, 2B, 8A-8B.....16	
Mathematics 16A-16B-16C.....9	
Statistics 13, 32, 100, or 102.....3-4	
Depth Subject Matter45	
Six courses in anthropology, including courses 152, 153 and 154A, and the remaining three chosen in consultation with major adviser.....22-25	
Biological Sciences 101 and Evolution and Ecology 100.....8	

Additional units from the list below to achieve a minimum of 45 upper division units.

Total units for the Major100-101

Recommended

Geology 1, 1L, 3, 3L; Physics 5A, 5B, 5C; Psychology 1, 15.

Bachelor of Science List of Courses

Anthropology 151, 154B, 155, 156, 157, 157L, 158; Anatomy 100; Biological Sciences 102, 103; Evolution and Ecology 101, 102, 105, 106, 133, 136, 136L, 138, 141, 147, 149, 170, 170L; Environmental Studies 100, 125; Geography 117; Geology 106, 107, 107L, 110, 144, 145, 146; Cell Biology and Human Anatomy 101, 101L; Molecular and Cellular Biology 120L, 121, 146, 150, 150L, 151, 160L, 161, 162, 163, 164; Neurobiology, Physiology and Behavior 110, 110L, 143, 148, 155; Physical Education 103, 115; Psychology 108, 112, 150; Statistics 104, 106, 108, 110, 130A, 130B.

Major Advisers. A.B. degree: R. Curley, B.S. degree: H.M. McHenry.

Minor Program Requirements:

	UNITS
Anthropology19-24	
General emphasis22-25	
One course from Anthropology 117, 119, 120.....4	
One course from Anthropology 151, 152, 153, 154A, 154B, 155, 156, 157, 157L, 158.....2-5	
One course from Anthropology 170, 171, 173, 174, 175.....4	
One course from Anthropology 140A, 140B, 141A, 141B, 141C, 142, 143, 144, 145, 146, 147, 148A, 148B, 149A, 149B, 176.....4	
One course from Anthropology 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 133, 135, 136, 137, 138.....4	
One additional course from remaining upper division Anthropology courses.....4	
Biological emphasis18-21	
Anthropology 152, 153, 154A.....13	
Two additional upper division Anthropology courses chosen in consultation with B.S. degree undergraduate adviser.....5-8	
Social-Cultural emphasis18-21	
Anthropology 137.....4	
One course from Anthropology 140A, 140B, 141A, 141B, 141C, 142, 143, 144, 145, 146, 147, 148A, 148B, 149, 176.....4	
Two courses from Anthropology 101, 117, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 133, 135.....8	
One additional upper division Anthropology course chosen in consultation with A.B. degree undergraduate adviser.....2-5	
Teaching Credential Subject Representative.	
See also the Teacher Education Program.	

Graduate Study. The Department offers a program of study leading to the M.A. and Ph.D. degrees in Anthropology. Further information regarding graduate study may be obtained at the Department Office and at Graduate Studies.

Graduate Adviser. C.A. Smith; J.S. Smith.

Courses in Anthropology (ANT)

Lower Division Courses

1. Human Evolutionary Biology (4) I. McHenry; II. Rodman, III. D.G. Smith
 Lecture—3 hours; discussion—1 hour. Introduction to human evolution. Processes and course of human evolution; man's place in nature and the study of primates; the biological variability of living man and the genetic background. General Education credit: Nature and Environment.

*Course not offered this academic year.

2. Cultural Anthropology (4) I. Davis; II. Lavie; III. Curley

Lecture—3 hours; discussion—1 hour. Introduction to cultural diversity and the methods used by anthropologists to account for it. Family relations, economic activities, politics, gender, and religion in a wide range of societies. Current problems in tribal and peasant societies. General Education credit: Contemporary Societies.

3. Introduction to Archaeology (4) I, III. Beaton
Lecture—3 hours; discussion—1 hour. Development of archaeology as an anthropological study; objectives and methods of modern archaeology.

4. Introduction to Anthropological Linguistics (4) I. The Staff; II. Wall

Lecture—3 hours; discussion—1 hour. Exploration of the role of language in social interaction and world view, minority languages and dialects, bilingualism, literacy, the social motivation of language change. Introduction of analytical techniques of linguistics and demonstration of their relevance to language in socio-cultural issues. General Education credit: Contemporary Societies.

***5. Proseminar in Biological Anthropology** (4) III. Rodman

Seminar—3 hours; term paper. Prerequisite: course 1 and consent of instructor. Course primarily for majors. Integration of related disciplines in the study of biological anthropology through discussion and research projects. Principal emphasis in human adaptation to the environment.

15. Behavioral and Evolutionary Biology of the Human Life Cycle (5) II. The Staff

Lecture—3 hours; discussion—1 hour; term paper. Introduction to the biology of birth, childhood, marriage, the family, old age, and death. Examines comparative characteristics of nonhuman primates and other animals as well as cross-cultural variation in humans by study of selected cases. General Education credit: Nature and Environment.

***20. Comparative Cultures** (4) III. Curley

Lecture—3 hours; discussion—1 hour. Introduction to the anthropological study of cultural diversity. Case studies of eight societies will be presented to illustrate and compare the distinctive features of major cultural regions of the world. Concludes with a discussion of modernization.

21. Anthropological Perspectives on the Politics of Culture in the United States (4) III. Hale

Lecture—3 hours; discussion—1 hour. Primarily for non-majors. Examines what comparative anthropological analysis can contribute to an understanding of the high-profile issues of cultural politics (the so-called "culture wars") in our own society. Offered in alternate years.

***23. Introduction to World Prehistory** (4) III. Beaton

Lecture—3 hours; discussion—1 hour. Broadly surveys patterns and changes in the human species' physical and cultural evolution from earliest evidence for "humanness" to recent development of large-scale complex societies or "civilizations." Lectures emphasize use of archaeology in reconstructing the past. General Education credit: Nature and Environment.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Primarily intended for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses**101. Human Ecology** (4) II. Borgerhoff-Mulder

Lecture—3 hours; discussion—1 hour. Prerequisite: one course from course 1, 2, Environmental Studies 30, Genetics 10, or the equivalent. Critical variables in the processes that relate humans and their environment. Emphasis on the biological, cultural, social, and psychological forces which encourage stability or change in human ecological relationships. (Same course as Environmental Studies 101.) General Education credit: Contemporary Societies.

(a) Anthropological Linguistics

***110. Elementary Linguistic Analysis** (4) II. Macri
Lecture—3 hours; discussion—1 hour. Prerequisite: course 4 or Linguistics 1. Analytical techniques of articulatory phonetics, phonemics, morphophonemics, and morphology.

***112. Comparative Linguistics** (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Linguistic prehistory, historical linguistics, and reconstruction.

***113. Indigenous Languages of North America** (4) III. Macri

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4, Linguistics 1, or consent of instructor. Survey of indigenous languages of North America, including their classification, linguistic characteristics, areal features, and socio-cultural aspects.

117. Language and Society (4) III. J.S. Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4, or Linguistics 1 and course 2. Consideration of language in its social context. Methods of data collection and analysis; identification of socially significant linguistic variables. Contributions of the study of contextualized speech to linguistic theory. General Education credit: Contemporary Societies.

119. World Writing Systems (4) II. Macri

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4 or Linguistics 1. Survey of major world writing systems, including pictographic, syllabic, and alphabetic scripts used in both the Old and New Worlds in ancient and modern times, examined from linguistic and socio-political aspects.

120. Language and Culture (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4; or course 2 and Linguistics 1. Culture, cognition, meaning, and interpretation; language and the classification of experience; communication and learning in crosscultural perspective.

(b) Social-Cultural Anthropology***121. Folklore** (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or literary preparation acceptable to instructor. Theory and method in the study of folktales, myths, legends, proverbs, riddles, songs, and other forms of verbal tradition.

122. Economic Anthropology (4) III. Davis

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Economic behavior in nonindustrial societies; its social and cultural setting and its modern changes.

***123A. Anthropology and Political Economy** (4) I. C. Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of anthropological approaches to the study of political organizations; interrelationships among political institutions, economic infrastructures and cultural complexity.

123B. Resistance, Rebellion, and Popular Movements (4) III. Hale

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or the equivalent. Analysis of popular protest in Third World and indigenous societies ranging from covert resistance to national revolts. Comparative case studies and theories of peasant rebellions, millenarian movements, social bandits, Indian "wars", ethnic and regional conflicts, gender and class conflicts.

124. Religion in Society and Culture (4) II. Curley

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Discussion of anthropological theories of religion with emphasis on non-literate societies. Survey of shamanism, magic and witchcraft, ritual and symbols, and religious movements. Extensive discussion of ethnographic examples and analysis of social functions of religious institutions. General Education credit: Contemporary Societies.

***125A. Structuralism and Symbolism** (4) I. Yengoyan

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Survey of anthropological approaches to understanding the logic of structuralism and symbolism

in cultural analysis. Focus on how structural and symbolic interpretations relate to cultural and linguistic universals and to the philosophical basis of relativism in the social sciences. (Former course 125.)

126. Anthropology of Development (4) I. Boyd

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of theories of social and economic change. Social and economic consequences of technological innovation. Application of anthropological theory to case studies of rural economy and society.

127. Urban Anthropology (4) II. Walton

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of approaches to urban living: political structures, organization of labor, class relations, world views. The evolution of urban life and its contemporary dilemmas. Cross-cultural comparisons discussed through case studies.

128. Kinship and Social Organization (4) II. Davis

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Theoretical discussion of social organization with primary emphasis on typology and classification of family and kinship systems.

129. Psychological Anthropology (4) III. Joseph

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Comparative exploration of the individual in foraging, horticultural, pastoral, agricultural, and industrial societies. Impact of class and state formation, ethnicity, poverty, ruralization, urbanization, economic and political change on the individual. General Education credit: Contemporary Societies.

130. Gender and Sexuality: Cultural Evolutionary Perspective (4) II. Joseph

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Gender and sexuality in foraging bands, horticultural and pastoral tribes, agricultural and industrial states. Debates on cultural evolution and distribution of gender hierarchies. Impact of politics, economics, religion, social practices, women's movements on gender and sexuality. Culture, nature and sexuality. General Education credit: Contemporary Societies.

***131. Women and Development** (4) II. Joseph

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Current Third World and Western development issues concerning women in agriculture, industry, international division of labor, political movements, revolutions, politics of health, education, family and reproduction. Impact of colonialism, capitalism, the world system, and international feminism on women and development.

132N. Ethnohistory (4) I, II. Walton

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 and one other course in either history or anthropology. Course focuses on method and interpretation involved in reconstructing the history and cultural experience of those "people without history" who left no documentary record (pre-literate societies, slaves, peasants). Emphasizes cross-cultural comparison and complementary methods (archaeology, demography, oral history, travel accounts).

133. Cultural Ecology (4) III. Orlove

Lecture—3 hours; discussion—1 hour. Comparative survey of the interaction between diverse human cultural systems and the environment. Primary emphasis given to people in rural and relatively undeveloped environments as a basis for interpreting more complex environments. General Education credit: Contemporary Societies. (Same course as Environmental Studies 133.)

***134. Race and Sex: Race Mixture and Mixed Populations** (4) II. Forbes

Lecture—3 hours; discussion—1 hour. Phenomena of race mixture (miscegenation), interracial marriage, and mixed (hybrid) human populations. Emphasis on social and cultural effects of race mixture and of the interaction of racism and sexual behavior.

135. Peasant Society and Culture (4) I. C.A. Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Comparative study of peasant communities,

utilizing historical and ethnographic sources; analysis of urban-rural relations; problems of economic development and culture change.

136. Ethnographic Film (4) II. Curley
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Overview of the use of film in anthropology and its advantages and limitations in comparison to written ethnographic descriptions. Essential features of ethnographic films. Film production in anthropological research and problems encountered in producing films in the field.

137. Theory in Social-Cultural Anthropology (4) I. Boyd
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Comparative overview of major theoretical orientations in social-cultural anthropology, including evolutionary, historical, functional, ecological, psychological, structural, symbolic, and Marxian approaches. Selected controversies are examined to clarify strengths and limitations of extant theories.

***138. Ethnographic Research Methods in Anthropology (4) II.** Boyd
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 2 and 137. Basic concepts in and approaches to ethnographic field research. Problem formulation, research design, qualitative and quantitative data collection procedures, and techniques for organizing, retrieving, and analyzing information. Ethnographic description and constructed inference. Students will organize and conduct individual research projects.

139. Race, Class, Gender Systems (4) I. C.A. Smith
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Comparative analysis of class/race/gender inequality, concentrating on the ways in which beliefs about descent, "blood," and biological difference interact with property and marital systems to affect the distribution of power in society.

140A. Cultures and Societies of West and Central Africa (4) I. Curley
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Ethnographic survey of West Africa and Congo Basin with analyses of representative societies which illustrate problems of general theoretical concern. Major consideration will be the continuities and discontinuities between periods prior to European contact and the present.

***140B. Cultures and Societies of East and South Africa (4) I.** Curley
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Ethnographic survey of Eastern and Southern Africa with analyses of selected societies which illustrate problems of interest to anthropologists. Major consideration will be given to continuities and discontinuities between periods prior to European contact and the present.

***141A. Indians of North America (4) II.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Introductory survey of the Indians of North America: origins, languages, civilizations, and history.

***141B. Ethnography of California and the Great Basin (4) III.** Bettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Description and analysis of the native peoples of California and the Great Basin, and their lifeways at the time of European contact. (Former course 141C.)

142. Peoples of the Middle East (4) I. Lavie
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Peoples of the Middle East (including North Africa). Discussions of class relations, kinship organization, sex/gender systems, religious beliefs and behavior, ethnic relations, political systems. Impact of world systems, political and religious movements and social change. (Former course 136.)

143A. Ethnology of Southeast Asia (4) III. Davis, Yengoyan
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Patterns of culture and social organization from prehistory to the present, in the context of historical, ecological, economic, and political settings. Emphasis on the relation of ethnic minorities to national states. Offered in alternate years.

143B. Philippine Societies and Culture (4) III. Davis
Laboratory/discussion—4 hours. Prerequisite: course 2. Introduction to the ethnology of the Philippines. Nature and distribution of ethnic groups, social organizations, cultural patterns and social issues. Emphasis on ethnic minorities, rural populations, effects of modernization, and relation of the state to local groups.

***144. Contemporary Societies and Cultures of Latin America (4) II.** Orlove
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Introduction to contemporary social structure of Latin America. Origins, maintenance and changes in inequality: economic responses to poverty, socio-cultural responses to discrimination, and political responses to powerlessness.

***145. Colonialism and Ethnicity in the Caribbean (4) II.** Hale
Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: course 2 or Afro-American Studies 10. Examination of the contemporary Caribbean nations, sketching their diverse geography, history, and economic life, then showing how selected nations have attempted to solve the problems arising from ethnic diversity in nation-building.

146. Indigenous Peoples of Mexico and Central America (4) II. C.A. Smith
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Ethnographic survey of the native peoples of Mexico and Central America: their histories, socio-political organization, mythologies, languages, material culture, writing systems.

147. Peoples of the Pacific (4) II. Boyd
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Ethnographic survey of aboriginal cultures of Oceania. Comparison of origins, prehistory, and traditional social organization of peoples of Polynesia, Micronesia, and Melanesia. Consideration of recent changes associated with colonialism and national independence.

148A. Traditional Chinese Society (4) III. Skinner
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Analysis of society, culture, and political economy of late traditional China to 1949. Additional attention given to nature of social change in this premodern agrarian civilization.

***148B. Family, Gender, and Population in Contemporary China (4) III.** Skinner
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Analysis of family process, gender relations, and population dynamics in relation to state power in China since 1949.

149A. Traditional Japanese Society (4) III. J. S. Smith
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Patterns of culture and social organization from prehistoric to early twentieth-century Japan. Origins, prehistory, and traditional religious and political systems, marriage and kinship, language and culture. Changes and continuities in traditional and contemporary Japanese culture are addressed. Offered in alternate years.

***149B. Contemporary Japanese Society (4) III.** J. S. Smith
Lecture—3 hours; discussion—1 hour. Introduction to contemporary Japanese social structure, social organization, and patterns of culture. Analysis of rural-urban cultural continuities and contrasts, class relations, political and economic systems, kinship, sex/gender systems, contemporary religious beliefs and behavior, conflict, consensus, and cultural stereotypes. Offered in alternate years.

(c) Biological Anthropology

151. Primate Evolution (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Biological Sciences 1B. Origin and relationships of the prosimians, monkeys, and apes.

152. Human Evolution and Fossil Man (4) II. McHenry
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Biological Sciences 1B. Nature and results

of the evolutionary processes involved in the formation and differentiation of mankind. General Education credit: Nature and Environment.

153. Human Biological Variation (4) I. D.G. Smith
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Biological Sciences 1B. Origin, adaptive significance and methods of analysis of genetic differences among human populations. Special attention will be given to racial differences such as those in blood groups, plasma proteins, red cell enzymes, physiology, morphology, pigmentation and dermatoglyphics. General Education credit: Nature and Environment.

154A. The Evolution of Primate Behavior (5) I. Rodman
Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: course 1. Examines ecological diversity and evolution of social systems of prosimians, monkeys, and apes, placing the social behavior of the primates in the context of appropriate ecological and evolutionary theory.

154B. Ecology and Sociobiology of Primates (4) III. Rodman
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 154A, Statistics 13 (or the equivalent), and consent of instructor. Continuation of course 154A for students interested in methods of studying, describing and analyzing the ecology and sociobiology of primates. Laboratory consists of direct observation of captive primates and local birds with quantitative analysis of observations.

***155. Comparative Primate Anatomy (4) II.** The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: Biological Sciences 1B. The functional anatomy of monkeys, apes, and man. Emphasis on the anatomical evidence for human evolution.

***156. Human Osteology (4) III.** McHenry
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 1 or the equivalent. Introductory study of the human skeleton, including bone growth, pathology, radiology, evolution, dentition, and variations in race, sex, and age.

***157. Anthropological Genetics (3) II.** D.G. Smith
Lecture—3 hours. Prerequisite: course 1 or Biological Sciences 1A, and Genetics 100, 103, 105, or 106. Processes of micro-evolution responsible for biological differences among human populations. Special attention will be given to the adaptive significance of genetic variation in blood group antigens, serum proteins and red cell enzymes.

***157L. Laboratory in Anthropological Genetics (2) I.** D.G. Smith
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 1 or Biological Sciences 1A, and either Genetics 100 or enrollment in course 157 (concurrently or following). Methods for identifying genetic variation in human blood group antigens, serum proteins and red cell enzymes (hemagglutination), general electrophoresis on starch, cellulose acetate and polyacrylamide, immunodiffusion and immunoelectrophoresis on agarose. (P/NP grading only.)

***158. The Evolution of Females and Males: Biological Perspective (4) II.** Hrdy
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Current theoretical frameworks for explaining the evolution of sex differences and for understanding the interrelationship between biological processes and cultural construction of gender roles.

(d) Archaeology and Prehistory

170. Archeological Theory and Method (4) II. Bettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 3. Introduction to history and development of archeological theory and method, with particular emphasis on the basic dependence of the latter on the former. Stress is on historical development of archaeology in the New World.

***171. Archaeology and the Environment (4) II.** Beaton
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Examines theoretical, methodological and

practical considerations in reconstruction of environmental histories and their importance in studying human ecology through archaeology. Environmental and human population dynamics and their interactions are considered particularly for non-complex societies. Offered in alternate years.

***172. New World Prehistory: The First Arrivals (4) II.** Beaton

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 or consent of instructor. Survey of data relating to the peopling of the New World. Cultural adaptation and development of early inhabitants of North and South America. Offered in alternate years.

***173. New World Prehistory: Archaic Adaptations (4) III.** Bettinger

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 or consent of instructor; course 170 recommended. Introduction to and survey of prehistoric hunting and gathering adaptations across North America with particular emphasis on the East, Southeast, Midwest, Plains, Southwest, and Northwest. Offered in alternate years.

***174. New World Prehistory: Formative Life-ways in North and South America (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 or consent of instructor. Transition from hunting and gathering subsistence to sedentary farming in the American Southwest, Mississippi Valley, and Andean South America. Offered in alternate years.

***175. New World Prehistory: The High Cultures Mesoamerica and Andean South America. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 or consent of instructor. Urban developments and the rise of civilization in Mexico and Peru.

***176. Prehistory of California and the Great Basin (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 or consent of instructor. Description and analysis of the prehistoric peoples of California and the Great Basin from earliest times to European contact.

178. Hunter-Gatherers (4) III. Bettinger

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Study and interpretation of the ancient and modern lifeway in which peoples support themselves with primitive technologies and without benefit of domesticated plants and animals. Offered in alternate years. General Education credit: Contemporary Societies.

***179. Ethnoarchaeology (4) II.** Beaton

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Relationships between behavior and its archaeological consequences. Ethnography by archaeologists examines residence patterning, site-formation processes, hunting/foraging behavior and other artifact creating activities and how these contribute to modern archeological thinking.

181. Field Course in Archeological Method (9)

Summer. The Staff
Lecture—6 hours; daily field investigation. Prerequisite: course 3. On-site course in archeological methods and techniques held at a field location in the western United States, generally California or Nevada. Introduces basic methods of archeological survey, mapping, and excavation.

***183. Laboratory in Archeological Analysis (4) III.** Bettinger

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 181 or consent of instructor. Museum preparation, advanced field investigation, and guidance in preparation of museum material for publication. May be repeated for credit with consent of instructor. Limited enrollment.

***184. Prehistoric Technology: The Material Aspects of Prehistoric Adaptation (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or 3. Examination of the role of lithic, ceramic, textile and wooden implements as elements in prehistoric survival and development. Emphasis is descriptive, but the significance of material resources as factors in prehistoric adaptation, settlement patterns, and culture change are discussed.

(e) Special Study Courses

191. Topics in Anthropology (4) I. Bettinger
Lecture/discussion—3 hours; term paper. Prerequisite: junior or senior standing in anthropology. Intensive treatment of a special anthropological topic or problem. May be repeated once for credit when topic differs.

192. Internship in Anthropology (1-12) I, II, III. The Staff

Internship—3-36 hours. Prerequisite: Upper division standing; consent of instructor. Work experience off and on campus in all subject areas offered in the Department of Anthropology under the supervision of a member of the faculty. Limited to Anthropology majors. May be repeated for a total of 12 units including 192 courses taken in other departments. (P/NP grading only.)

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: open only to majors of senior standing who qualify for honors program. Independent study of an anthropological problem involving the writing of an honors thesis. (P/NP grading only.)

197T. Tutoring in Anthropology (1-5) I, II, III. The Staff

Tutorial—1-5 hours. Prerequisite: upper division standing with major in Anthropology and consent of Department Chairperson. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

201. History of Anthropological Theory (4) I. Curley

Lecture—2 hours; discussion—1 hour; term paper. Historical development of the various fields of anthropology with emphasis upon their interrelationships.

***202. History and Theory of Biological Anthropology (4) III.** McHenry

Seminar—3 hours; term paper. History of thought in biological anthropology and analysis of major theoretical problems in the field. Suggested for all first-year graduate students lacking intensive preparation in biological anthropology.

***203. History and Theory of Archaeology (3) I.** Bettinger

Seminar—3 hours. History of thought in archaeology and analysis of research methods.

204. Contemporary Issues in Anthropological Theory (4) II. Hale

Seminar—3 hours; term paper. Prerequisite: course 2, 137 or consent of instructor. Advanced consideration of fundamental issues in anthropological theory. Emphasis on critical examination of major contemporary debates between proponents of competing theories.

205. History and Theory in Anthropological Linguistics (4) II. J.S. Smith

Seminar—3 hours; term paper. History of thought in anthropological linguistics. Consideration of the historical development of fundamental ideas in anthropological linguistics, of major theoretical issues, and of research methodology.

206. Research Design and Method in Social Anthropology (5) III. Joseph, Skinner

Seminar—4 hours; individual student-instructor session (in-depth work on proposal writing). Prerequisite: consent of instructor. Formulation of research problems and preparation of research proposals; relationships between theory and method, funding, pre-fieldwork preparations, entering the community, field research techniques, and problems of ethics; intensive work on proposal writing. May be repeated once for credit. Limited enrollment.

***207. Ethnographic Writing (4) II.** Lavie

Seminar—3 hours; term paper. Prerequisite: courses 137, 201, or the equivalent. Relationship between conducting participant observation of others and writing it up, emphasizing the processual rift between the reality of fieldwork and its written representation. Study of various literary genres and textual strategies used in cultural anthropology. May be repeated for credit. Offered in alternate years.

209. Objectives and Methods for College Teaching of Anthropology (2) I, II, III. The Staff

Discussion—2 hours; assignments and reports. Prerequisite: normally limited to teaching assistants in anthropology. Analysis of the elements of effective teaching, drawing upon the student's experience in the classroom situation.

210. Aspects of Culture Structure (4) III. Boyd
Seminar—3 hours; term paper. Analysis of various phases of culture, such as religion, economics, law, and folklore. May be repeated for credit when topic differs.

***211. Advanced Topics in Cultural Ecology (3) I.** Orlove

Lecture—3 hours. Prerequisite: graduate standing; Anthropology/Environmental Studies 133 or the equivalent or consent of instructor. Discussion and evaluation of theories which relate environment, culture, and social structure. The works of several major theorists will be examined with regard to analytical models, empirical data, research methodologies, and modes of explanation. Offered in alternate years. (Same course as Ecology 211.)

216. Problems in Archeological Method (4) II. Beaton

Seminar—3 hours; term paper. Techniques for analyzing archeological data; application to various prehistoric cultures. May be repeated for credit with consent of instructor.

***217. Andean Prehistory: Theory and Method (4) III.**

Seminar—3 hours; term paper. Prerequisite: consent of instructor. Discussion and evaluation of prehistoric occupations in the Andean Region of South America. Emphasis upon Pre-ceramic and early farming peoples.

218. Topics in North American Prehistory (4) I.

Bettinger
Seminar—3 hours; term paper. Advanced study on current problems in North American prehistory and archaeology. May be repeated for credit only if material is unique for that student, and with consent of instructor.

***220. Field Course in Linguistics (4) III.** Macri

Seminar—2 hours; laboratory—2 hours. Prerequisite: courses 110, 111. Techniques of eliciting, recording, and analyzing; work with a native speaker.

221. Rural Transformation in Postcolonial Societies (4) I. Orlove

Seminar—3 hours; term paper. Prerequisite: courses 223, 265, or consent of instructor. Problems of rural transformation arising out of political and economic interaction between national elites and rural regional and local populations under varying conditions of induced change in postcolonial societies. Attention will be given to the implications of this interaction for rapid economic growth. May be repeated for credit.

***222. Problems in Urban Anthropology (4) I.** Walton
Seminar—3 hours; one paper. Prerequisite: graduate status or consent of instructor. Study of selected critical problems in urban anthropology. Each quarter focuses on some of the following topics: class, minorities, poverty, migration, religion, politics, kinship, community, sex-roles, communication, ideology, consciousness in urban context. May be repeated for credit.

***223. Economic Anthropology (4) III.** Davis

Seminar—3 hours; term paper. Prerequisite: course 122 or consent of instructor. Selected current methodological and theoretical problems in the analysis of nonindustrial economic systems.

***224. Problems in Comparative Religion (4) I.**

Curley
Seminar—3 hours; term paper. Advanced study of current problems in the anthropological study of religion.

225. State and Nation in the Modern World (4) II.

C. A. Smith
Seminar—3 hours; term paper. A presentation of current anthropological theories of the origins and nature of the modern nation-state in both the First and Third Worlds, with special reference to state ideology (nationalism) and forms of control. Offered in alternate years.

***226. Consciousness and Resistance (4) III.** Hale
Seminar—3 hours; term paper. Prerequisite: completion of first-year graduate work or consent of instructor. Consideration of approaches to the study of social inequality, and responses of subordinated groups. Emphasis on situating approaches to contemporary social theory, concrete research problems, and political strategies. Topics: formation of consciousness and identity; collective action, accommodation to frontal resistance. Offered in alternate years.

227. Behavioral Ecology and Anthropology (4) III.

Borgerhoff-Mulder
Seminar—3 hours; term paper. Prerequisite: graduate standing. An exploration of the links between behavioral ecology and the study of human cultural variation, focusing on social organization, marriage, reproduction, inheritance and subsistence in traditional and historical populations. May be repeated once for credit. Offered in alternate years.

229. Gender, Identity, and Self (4) III. Joseph
Seminar—3 hours; term paper. Course covers intersections of gender, identity, and selfhood cross-culturally and historically. Explores how the self is feminized and masculinized, and interfaces with sexual, race, class, work, national, minority, and majority identities under different historical, cultural, and social structural conditions.

***230. Comparative Family Demography (4) II.**

Skinner
Lecture—2 hours; discussion—2 hours. Prerequisite: graduate standing in one of the social sciences (including History). Comparative examination of population processes—marriage/nuptiality, fertility/reproduction, mortality, and migration—in sociocultural and historical context, with an emphasis on contrasting family systems. Case studies are drawn from Western Europe (France, Italy) and East Asia (China, Japan, Thailand). Offered in alternate years.

232. Political Movements (4) I. Walton
Seminar—3 hours; term paper. Prerequisite: completion of first-year graduate work recommended. Interdisciplinary approach to political movements of protest, reform, and revolution emphasizing historical comparison and evaluation of major theoretical approaches including world systems, resource mobilization, state and culture, rational choice, moral economy, social class and gender.

***239. Problems in African Society and Culture (4) I.**

Curley
Seminar—3 hours; term paper. Diachronic analyses of traditional institutions in sub-Saharan Africa.

***240. Problems in Afro-American Studies (4) III.**
Seminar—3 hours; term paper. Comparative studies of selected Black communities in the New World.

***241. Topics in North American Ethnology (4) III.**

Forbes
Seminar—3 hours; term paper. Advanced study on current problems in North American ethnography and culture history. May be repeated for credit with consent of instructor.

***245. Ethnology of Northern and Central Asia (4) II.**

Seminar—3 hours; term paper. Prerequisite: a reading knowledge of German, Russian, Chinese, or Japanese. Lectures on the culture aboriginally found north of the Caucasus-Korea line. Supervised study of the primary and secondary sources. Work with informants when available.

***246. Ethnology of Europe (4) II.**

Seminar—3 hours; term paper. Prerequisite: reading knowledge of a European language other than English. Supervised study of the primary and secondary sources dealing with the ethnography and ethnology of the peoples of Europe. Emphasis upon folk, peasant, and minority groups.

252. Human Evolution Seminar (4) II. McHenry
Seminar—3 hours; term paper. Prerequisite: course 152 or the equivalent; consent of instructor. Study of selected topics in human evolutionary studies. Each year course will focus on one or more of the following: molecular evolution, primate evolutionary biology, Tertiary hominoids, *Australopithecus*, *Homo erectus*, archaic *Homo sapiens*, brain evolution. May be repeated for credit.

***253. Seminar in Human Biology (4) III.** D.G. Smith
Seminar—3 hours; term paper. Prerequisite: course 153, 157, or consent of instructor. Study of selected topics in human biology. May be repeated for credit when topics vary. Offered in alternate years.

254. Current Issues in Primate Sociobiology (4) I.

Rodman
Seminar—3 hours; term paper. Prerequisite: course 154B or the equivalent. Analysis of primate behavior, with particular emphasis on preparation for field studies. May be repeated for credit when different topic covered.

***258. Evolution and Human Behavior (4) II.** Hrdy
Seminar—3 hours; term paper. Prerequisite: courses 15; 101; 154 A or 154B; 158 or consent of instructor. Focus will be on reproductive strategies and parental investment. May be repeated for credit when topics vary.

***265. Concepts and Problems in Applied Anthropology (4) II.**

The Staff
Seminar—3 hours; term paper. Prerequisite: consent of instructor. Advanced study in culture change; case studies of directed culture change; problems of planning and evaluation; uses of anthropological theory and data in professional fields such as agriculture, public health, administration, and international technical assistance.

270. Anthropology Colloquium Seminar (1) I, II, III.

The Staff
Seminar—1 hour. Reports and discussions of recent advances in the four subfields of anthropology. To be presented by guest speakers. May be repeated twice for credit. (S/U grading only.)

292. Seminar in Linguistic Anthropology (4) III.

Macri
Seminar—3 hours; term paper. Selected topics in linguistic anthropology. May be repeated for credit when topic differs.

298. Group Study (1-4) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Applied Behavioral Sciences

(College of Agricultural and Environmental Sciences)

Lawrence V. Harper, Ph.D., Chairperson of the Department

Stephen B. Brush, Ph.D., Associate Chairperson of the Department

Department Advising Office, 1303 Hart Hall (916-752-2244)

Community Studies and Development and Human Development (916-752-0770)

Community Studies and Development**Faculty**

Stephen B. Brush, Ph.D., Professor
Isao Fujimoto, M.A., Senior Lecturer
Barbara G. Goldman, Ph.D., Lecturer and Supervisor of Teacher Education

James Grieshop, Ph.D., Lecturer/CE Specialist
Luis E. Guarnizo, Ph.D., Assistant Professor
Frank Hirtz, Ph.D., Assistant Professor
Martin F. Kenney, Ph.D., Professor
E. Dean MacCannell, Ph.D., Professor
Michael P. Smith, Ph.D., Professor
Miriam J. Wells, Ph.D., Professor

Emeriti Faculty

Marc Pilisuk, Ph.D., Professor Emeritus
Orville E. Thompson, Ph.D., Professor Emeritus

Human Development and Family Studies**Faculty**

Curtis R. Acredolo, Ph.D., Adjunct Associate Professor

Carolyn Aldwin, Ph.D., Assistant Professor
Keith Barton, Ph.D., Professor
Brenda K. Bryant, Ph.D., Professor
James Chisholm, Ph.D., Associate Professor
Lawrence V. Harper, Ph.D., Professor
Rosemarie Kraft, Ph.D., Associate Professor
Beth Ober, Ph.D., Assistant Professor
Emmy E. Werner, Ph.D., Professor

Emeriti Faculty

Louise M. Bachtold, Ed.D., Professor Emerita
Glenn R. Hawkes, Ph.D., Professor Emeritus
David B. Lynn, Ph.D., Professor Emeritus

The Major Program

The applied behavioral sciences major is concerned with the study of communities and the people in them. The program focuses on community and organizational development, the role of culture and ethnicity in shaping community life, and the ways that knowledge can be used to solve social problems and improve the quality of life.

The Program. Principal subjects of study within the major are: community and organizational development, social change processes, the role of culture and ethnicity in shaping community life, community research methodologies, the impacts of innovation and technology on community development, and the effects of social, economic and political systems on communities. In addition, the Applied Behavioral Sciences major includes a student-designed field of concentration to complement the student's academic and career interests. Examples of recently approved areas of concentration are: organizational planning and management, aging and community development, health care in ethnic communities, community design and planning, socio-environmental planning, and community education.

Internships and Career Alternatives. Applied Behavioral Science students are required to have an internship in their field before graduation. Internships have been arranged with such agencies as local, county, and state planning units, health departments, schools, housing offices, and community education programs. Applied behavioral sciences graduates are prepared for occupations in community development, social research, program evaluation, organizational and educational consulting, city and regional planning, and community health. The major also provides effective preparation for graduate or professional study in the social and behavioral sciences.

B.S. Major Requirements:

	UNITS
English Composition Requirement	4-12
See College requirement	0-8
Additional English (English 103)	4
Preparatory Subject Matter	22-25
Community development (Applied Behavioral Sciences 1)	4

Computer science (Agricultural Science and Management 21 or Computer Science Engineering 15).....	3-4
Economic theory (Economics 1A or 1B).....	5
Ethnicity and American communities (Applied Behavioral Sciences 2).....	4
Social science theory (Anthropology 2 or Sociology 1).....	4-5
Statistics (Statistics 13 or Sociology 46B).....	3-4
Breadth/General Education Requirement.....	24
Satisfaction of General Education requirement to include:	
Sciences and mathematics.....	8
Humanities (Proficiency in a second language is specifically useful to an understanding of particular aspects of the community. Students planning to work in a minority community are encouraged to select an appropriate language.).....	8
Social sciences.....	8
Depth Subject Matter.....	39
Methods for community research, Applied Behavioral Sciences 151 and 160.....	8
Social theory and community change, Applied Behavioral Sciences 154 or Sociology 165A.....	4
Institutional and organizational change, Applied Behavioral Sciences 164.....	4
Political processes and community change, one course from Applied Behavioral Sciences 157, 158, 171.....	4
Economics and community change, one course from Applied Behavioral Sciences 140 or 162 or Anthropology 122.....	4
Ethnicity and social inequality, Applied Behavioral Sciences 172 or 176.....	4
Community development and transfer of knowledge, one course from Applied Behavioral Sciences 152, 173, 175 or International Agricultural Development 103.....	4
Evaluation of human service programs, Applied Behavioral Sciences 168.....	4
Applied Behavioral Science seminar: Major Proposal, Applied Behavioral Sciences 193.....	1
Internship: Applied Behavioral Sciences 159.....	4
Field of concentration.....	37
Additional upper division courses related to the major, determined in consultation with faculty adviser. (Up to 5 units of variable-unit course work may be counted toward this requirement, e.g., Applied Behavioral Sciences 159, 192, 196, 197, 199.)	
Unrestricted Electives.....	43-54
Total Units for the Degree.....	180

Other Requirements

In consultation with a faculty and staff adviser, Applied Behavioral Sciences majors must develop a program of study which will comprise an area of specialization. Students must submit a written proposal for the major to be reviewed by a faculty committee.

Major Adviser. M.J. Wells.

Advising Center for the major is located in 1303 Hart Hall (916-752-2244).

Minor in Community Development

Minor Program Requirements:

The Applied Behavioral Sciences faculty offers the following minor program:

	UNITS
Community Development.....	24
Applied Behavioral Sciences 1, 151, 152, 164.....	16
Two courses selected from the following:	
Applied Behavioral Sciences 140, 157, 158, 162, 168, 171, 172, 173, 175, 176, 178.....	8

Minor Adviser. M.J. Wells.

Graduate Study. Refer to the Graduate Studies section in this catalog.

Related Courses. See Environmental Studies 10, 101, 133.

Courses in Applied Behavioral Sciences (ABS)

Lower Division Courses

1. The Community (4) I. MacCannell

Lecture—4 hours. Basic concepts of community analysis and planned social change. The dynamics of community change through case studies of communities including peasant, urban ghetto, suburban mainline, and California farm workers

2. Ethnicity and American Communities (4) I. Guarino

Lecture—3 hours; discussion—1 hour. Historical and cultural survey of the role of various ethnic groups in the development of American communities. Examines ethnicity as a cultural factor, ethnicity as power and issues related to selected American ethnic groups. General Education credit: Contemporary Societies.

17. Population and Community (2) I. The Staff

Lecture—2 hours. Dynamics and challenges offered by demographic changes in California and the world community. Implications for individuals and communities. Special emphasis on the possible contributions each individual can make towards resolving global problems related to human ecology through local community action. (P/NP grading only.)

18. Science, Technology and Society (4) III. Kenney

Lecture—4 hours. Impact of developments in science and technology on the individual in society and how economics, politics, culture and values affect technological development.

47. Orientation to Community Resources (2) II. Thompson; III. Fujimoto

Field trip—4 days; seminar—three 2-hour sessions. (Course given between quarters). Prerequisite: consent of instructor. Intensive field course in San Francisco. Students interact with agencies and individuals who address the range of human service, educational and social needs in the city. Advance reservations required. (P/NP grading only.)

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: consent of instructor. Supervised internship, off and on campus, in community and institutional settings. (P/NP grading only.)

98. Directed Group Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses

*118. Technology and Society (4) II. Kenney

Lecture—3 hours; discussion—1 hour. Prerequisite: course 18 or consent of instructor. Impact of technology on labor relations, employment, industrial development and international relations. The internal relations of technology development and deployment.

140. Political Economy of Regional Development (4) III. Kenney

Lecture—4 hours. Prerequisite: one undergraduate economics, agricultural economics or political science course, or consent of instructor. Political economy of domestic regional development. Technology, labor relations and interfirm linkages. California and other regions as case studies.

151. Community Field Research: Theory and Analysis (3) I. Smith; II. Fujimoto

Lecture—3 hours. Prerequisite: course 151L must be taken concurrently; course 1 and any upper division Applied Behavioral Science course are recommended. Design and analysis of research at the community level with a focus on the relationship between practice and theory. Focus will be on conducting community research using structural analysis, elite

interviewing, ethnographic research, and other such research methods. General Education credit: Contemporary Societies.

151L. Laboratory in Community Research and Analysis: Field Experience (1-3) I. Smith;

II. Fujimoto
Fieldwork—3-9 hours. Prerequisite: course 151 concurrently. Field research focused on community or organizational issues and their resolution. Includes assignment with local agencies or community-based organizations. The focus will be conducting community research using such methods as structural analysis, elite interviewing, ethnographic research, and comparative community studies.

152. Community Development (4) III. Fujimoto

Lecture—4 hours. Prerequisite: course 151 or 1, Sociology 2, Anthropology 2, Asian American Studies 100, Chicano Studies 132, Geography 5, or African American Studies 101. Introduction to principles and strategies of community organizing and development. Examination of different citizen participation movements and the role of change agents in the development process. Students work in teams and conduct fieldwork in local communities.

*153. International Community Development (4) III. Fujimoto

Lecture—4 hours. Prerequisite: course 1, Anthropology 2, International Agricultural Development 10. Examination of community development efforts worldwide. Analysis of impact of global forces on community development in different settings. Alternative strategies with emphasis on self-reliance and locally controlled development. General Education credit: Contemporary Societies.

*154. Semiotics, Structuralism and Sociocultural Change (4) II. MacCannell

Lecture—4 hours. Prerequisite: course 1, Sociology 1, or Anthropology 2. Existentialism, structuralism, and semiotics and their application to current social issues and problems: nuclear technology, women's movement, ethnic relations, and other change arenas. General Education credit: Contemporary Societies.

157. Politics and Community Development (4) III. Smith

Lecture—4 hours. Prerequisite: prior course work in sociology or political science recommended. Analyzes political, economic and sociocultural forces shaping the form and function of local communities in the U.S. Considers theories of the state, the community and social change and case studies of actual community development in comparative historical perspective.

*158. Small Community Governance (4) II. Sokolow

Lecture/discussion—3 hours; fieldwork—3 hours. Prerequisite: course 151 or 160 or Political Science 100. Governing institutions and political processes in rural and small urban places. Local government organization, community autonomy, leadership, political change, policy development, and select policy issues including public finance. Field research on political processes or policy issues in select communities. Offered in alternate years.

159. Field Experience in Community Development (4) I. Fujimoto; II. The Staff; III. Fujimoto

Discussion—2 hours; field work—6 hours. Prerequisite: any one of courses 151, 152, 153, 154, or 157. Field involvement with community or organizational issues or problems and their resolution. May be repeated for credit for a total of 12 units with consent of instructor.

160. Research Design and Method in Community Studies (4) III. The Staff

Lecture—4 hours. Prerequisite: course 1; Statistics 13 or the equivalent. Application of behavioral science research methodology to multidisciplinary problems confronting communities and community organizations. Focuses on design, sampling, measurement and analysis.

161. Ethnographic Research in America (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: completion of 8 units of course work in Anthropology,

Sociology, or Applied Behavioral Sciences. Methodologies, ethics and goals of qualitative research. Emphasis on analyzing and conducting ethnographic research in American communities; problem formulation, analytic modes, data correction and interpretation. Offered in alternate years.

162. People, Work and Technology (4) I. Wells
Lecture—4 hours. Prerequisite: course work in the social sciences (e.g., Sociology 1, 3, Anthropology 137, Economics 1A, 1B) or labor history. Relationship between work, technology, and people's lives. Such topics as industrialization, bureaucratization, automation, the structure of work-linked communities, education and the labor market, work and the economic system and the future of work.

***163. Behavior of Community Organizations (4) I.** The Staff
Lecture—4 hours. Prerequisite: introductory social sciences course. How community organizations function and how members of organizations interact with each other, the organization, and those people who are clients of the organization. Effects of leadership, motivation, group dynamics, communications, and power.

164. Theories in Organizational Change (4) II. Hirtz
Lecture—4 hours. Prerequisite: course 1 or 2. Development of approaches to planned change including normative re-educative, applied systems, and developmental strategies.

168. Program Evaluation and the Management of Organizations (4) I. Goldman
Lecture—4 hours. Prerequisite: courses 160, 161. Role of program evaluation in organizational and program management. Impact of internal evaluation in program planning, improvement, and accountability.

***170. Communication of Innovations (4) I.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing and course work in the social sciences; course 1 or Sociology 1 recommended. Information exchange and innovation diffusion in organizational and social settings. Exploration of the role of information networks and communication channels in planned social change efforts. Philosophical consideration of the consequences of innovation dissemination.

171. Housing and Social Policy (4) III. Wells
Lecture—4 hours. Social impact, economics, and politics of housing in the United States. Special attention given to alternative policy strategies at the national and local levels.

172. Social Inequality: Issues and Innovations (4) III. Wells

Lecture—4 hours. Prerequisite: upper division standing; 8 units of sociology or anthropology or combination. Study of the phenomenon of inequality in the U.S. Various approaches to inequality will be examined, including structural and historical explanations, prejudice and discrimination, the "culture of poverty," and arguments concerning race, sex, and genetic potential.

173. The Continuing Learner (4) II. The Staff
Lecture—4 hours. Prerequisite: upper division standing. Theories of adult learning and teaching emphasizing the role of adult education in the community. Designing of adult education programs.

174. Communication for Community Change (4) III. The Staff
Lecture—4 hours. Prerequisite: course 1. Communication as a mechanism and method for creating change in communities. Theories and practices; impact of message on attitudes and behavior; ethics of change induced through communication. Offered in alternate years.

***175. Education in the Community (4) I.** The Staff
Lecture—4 hours. Prerequisite: upper division standing and course work in the social sciences; course 1 or Sociology 1 recommended. Function of education in the community. Relationships of community and non-formal education to formal education, schooling and to individual, community and national development. Planning process and role of education in social and community change. Offered in alternate years.

176. Comparative Ethnicity (4) II. Guarnizo
Lecture—4 hours. Prerequisite: upper division standing, 8 units of sociology or anthropology or combination. Exploration of the role of ethnicity in shaping social systems and interaction. Examination of analytical approaches to and issues arising from the study of ethnicity, through utilization of data from a range of different societies.

***178. Social Networks and Community Health (4) III.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Sociology 2. Relevance of social ties to the health of the individual, family and community. Multidisciplinary look at forces affecting family and friendship ties, as well as community services; and at how social bonds affect physical and psychological health. General Education credit: Contemporary Societies.

***190. Current Issues in Applied Behavioral Sciences (1) I, II, III.** The Staff
Seminar—1 hour. Current social, political, and economic issues affecting communities and individuals. One-hour presentations by guest speakers on research topics and contemporary issues in Community Development. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Supervised internship, off and on campus, in community and institutional settings. (P/NP grading only.)

193. Applied Behavioral Sciences Seminar: Major Proposal (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: upper division standing, Applied Behavioral Sciences major. Designing an Applied Behavioral Sciences major that incorporates course work and personal experience. Required of all Applied Behavioral Sciences majors. (P/NP grading only.)

***196. Senior Project in Applied Behavioral Sciences (1-5) I, II, III.** The Staff (Chairperson in charge)
Prerequisite: major in Applied Behavioral Sciences, and consent of instructor. Guided research leading to completion of senior thesis. May be repeated for credit. (P/NP grading only.)

197T. Tutoring in Applied Behavioral Sciences (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Leading of small voluntary discussion groups. (P/NP grading only.)

197TC Community Tutoring in Applied Behavioral Sciences (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Supervised tutoring in the community. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201. Planning Processes in Applied Behavioral Sciences (4) I. The Staff
Lecture—3 hours; supervised practice in planning—3 hours. Prerequisite: consent of instructor. Systematic approach to planning, including new concepts, theories, and methods for planning with application to educational institutions, agencies and the community at large.

202. Systems Approach for Organizational Change (4) III. Hirtz
Lecture—4 hours. Prerequisite: course 201 or consent of instructor. Organizational structure and processes from systems perspective, organization-environment interplay, dynamics of resource allocation, impact of power and environment on structure, communication networks, role of innovation and determinants of change. Emphasis upon applications of theory for organizational learning.

***203. Evaluation and Decision Making (4) II.** Goldman
Lecture—4 hours. Prerequisite: graduate standing; knowledge of social science research methodology. Focuses on theoretical formulations and methodological considerations when designing evaluation research studies for social programs. Includes examination of relationship between organizational planning, decision-making and evaluation research; value conflicts; multiple information requirements; social and political environment influencing evaluation studies.

240. Community Theory (4) I. The Staff
Lecture—2.5 hours; seminar—1.5 hours. Prerequisite: two or more upper division courses in sociology, anthropology, philosophy or critical theory. Classic and current theories of community with an emphasis on the comparative community research tradition from Redfield's Yucatan studies to Macro-social Accounting. Readings include Rousseau, Marx, Levi-Strauss, the Cornell School, Postmodernist accounts of community and critical theory.

241. The Economics of Community Development (4) II. Kenney
Lecture—4 hours. Prerequisite: course 240. Economic theories and methods of planning for communities. Human resources, community services and infrastructure, industrialization and technological change, and regional growth. The community's role in the greater economy.

***242. Community Development: Program Management (4) III.** The Staff
Seminar—4 hours. Prerequisite: course 241. Planning, organization, financing and administration of social change projects or programs at the community or city level.

***243. Professional Skills for Human Service and Community Development (4) I.** The Staff
Lecture—2 hours; seminar—2 hours. Prerequisite: graduate student standing in a social science discipline. Theory of interpersonal communication and small group process as applied to development of professional skills as community developer, program administrator and/or consultant.

***244. The Political Economy of Domestic Development (4) III.** Kenney
Lecture—4 hours. Prerequisite: course 241. Examination of the politics and institutions affecting the economic growth of regions. Theories of development and change are examined with specific reference to case study material.

245. The Political Economy of Urban and Regional Development (4) III. Smith
Lecture—4 hours. Prerequisite: course 157, 244, or the equivalent. How global politics and economic restructuring and national and state policies are mediated by community politics; social prediction of urban forces; role of the state in uneven development; dynamics of urban growth and decline; regional development in California.

290. Seminar (1) I, II, III. The Staff
Seminar—1 hour. Analysis of research in applied behavioral sciences. (S/U grading only.)

297. Practicum in Community Development (2) I, II. The Staff
Seminar—2 hours. Prerequisite: course 243 and field placement in community human service agency. Application of theories and approaches of community development through field placement in a community or human service agency. Further development of skills as change agents in community settings. Consideration of the field placement as it relates to relevant research. May be repeated for a maximum of 4 units. (S/U grading only.)

298. Group Study (1-5) I. Guarnizo; II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Applied Biological Systems Technology

(College of Agricultural and Environmental Sciences)

Faculty. See under Department of Biological and Agricultural Engineering.

Minor Program. The Department of Biological and Agricultural Engineering offers a minor in Applied Biological Systems Technology. This minor is designed for non-engineering students interested in becoming familiar with engineering terminology and procedures. Coursework provides knowledge of material properties, design procedures, fabrication principles, and hardware practices.

Minor Program Requirements:

UNITS

Materials requirement2

Choose one from Applied Biological Systems Technology 15, 16, or 17

Design requirement3

Applied Biological Systems Technology 170

Principles and Practices requirement15

Select at least nine units from: Applied Biological Systems Technology 101, 103, 105, 110L, 121, 125, 134, 141, 141AT, 145, 147, 161, 163, 165; and select the remaining units from: Agronomy 110, Animal Science 118, 119, 143, 146, Environmental Horticulture 125, Food Science and Technology 102, 102L, 110A, 110B, 111, Plant Science 112, 112L, 196, Viticulture and Enology 140, Water Science 110.

Total Units for the Minor (minimum)20

Minor Advisor. H.E. Studer.

Courses in Applied Biological Systems Technology (ABT)

These courses are intended primarily for students not majoring in Engineering. Majors in Engineering should refer to courses in Engineering: Biological and Agricultural (Biological Systems Engineering). Questions pertaining to the following courses should be directed to the instructor or to the Department of Biological and Agricultural Engineering, 2030 Bainer Hall.

Lower Division Courses

15. Wood Properties and Fabrication (2) III.

Grismer
Lecture—1 hour; laboratory—3 hours. Physical principles and properties of woods as related to strength, design procedures, and selection and use of wood-working equipment. Experience in working with wood. Not open for credit to students who have completed Consumer Technology 15. (P/NP grading only.)

16. Metal Properties and Fabrication (2) I.

J. Rumsey
Lecture—1 hour; laboratory—3 hours. Study of metal properties and of techniques for fabricating in metal. Physical principles, design considerations, effects of techniques on quality and appearance, and evaluation procedures. Experience in working with metal. Not open for credit to students who have completed Consumer Technology 16. (P/NP grading only.)

17. Plastic Properties and Fabrication (2) III. The Staff

Lecture—1 hour; laboratory—3 hours. Study of the properties of plastic materials and the fundamentals of fabrication techniques. Experience in working with common plastics, with applications to biological systems. (P/NP grading only.)

49. Field Equipment Operation (2) I, III. J. Rumsey
Lecture—1 hour; laboratory—3 hours. Operation, adjustment, and troubleshooting of farm tractors and field equipment. Principles of operation, equipment terminology and uses of tilling, cultivating, thinning, and planting equipment. Typical sequences in crop-

ping practices. Not open for credit to students who have completed Agricultural Practices 49. (P/NP grading only.)

52. Field Equipment Maintenance (2) II. J. Rumsey
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 16 or consent of instructor. Trouble-shooting and major repair of field equipment. Intermediate welding to include hardfacing and inert gas welding. Class projects on maintenance, repair and fabrication. Not open to students who have completed Agricultural Practices 149. (P/NP grading only.)

90C. Research Conference for Lower Division Students (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: consent of instructor. Research conference for specialized study in applied biological systems technology. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff

(Hills in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Hills in charge)

(P/NP grading only.)

Upper Division Courses

101. Engine Technology (3) II. Upadhyaya

Lecture—2 hours; laboratory—3 hours. Prerequisite: upper division standing or consent of instructor. Principles of engine construction and operation. Ideal Otto and Diesel cycles. Engine efficiencies and power measurements. Study of valves, fuels, combustion, carburetion and fuel injection, conventional and electronic ignition, starting and charging, cooling, lubrication and emission control systems. Not open for credit to students who have completed Consumer Technology 101.

103. Electric Power Applications (3) III. Garrett

Lecture—2 hours; laboratory—3 hours. Prerequisite: Physics 1B or 5B. Principles of electric power involved in common home and light industrial applications; experience in techniques of wiring, motor and appliance selection, energy conservation and safety. Not open for credit to students who have completed Consumer Technology 17.

105. Computer Application for Measurement and Control (3) II. Slaughter

Lecture—2 hours; laboratory—3 hours. Prerequisite: upper division standing; introductory course in computer programming. Introduction to computer systems for measurement and control of biological systems. Basic computer hardware and software concepts, programming, and input/output systems. Sensor fundamentals and applications. Computer control of biological processes and environments.

110L. Experiments in Food Engineering (2) II. Singh

Laboratory—6 hours. Prerequisite: Food Science and Technology 110B (may be taken concurrently). Use of temperature sensors; measurement of thermal conductivity and heat transfer in food; refrigeration, freezing, concentration and dehydration of foods. Not open for credit to students who have completed Agricultural Engineering Technology 110L.

121. Structures and Environmental Control (2) II. Studer

Lecture—2 hours. Prerequisite: Plant Science 2 or Animal Science 1 or 2, or Environmental Horticulture 6. Optimal structures and environments for plants and animals; animal energetics; psychometrics; heat and vapor transmission in buildings; temperature and humidity control; greenhouse design; energy conservation; lighting systems; heating, cooling, ventilating principles and equipment. Not open for credit to students who have completed Agricultural Engineering Technology 112.

125. Environmental Considerations in Home Design (2) III. Garrett

Lecture—1 hour; discussion—1 hour. Study of factors to be considered in planning or remodeling homes, including effects of design and choice of materials on safety, energy efficiency and compatibility with the surrounding environment. Not open for

credit to students who have completed Consumer Technology 111.

134. Pest Control Practices (2) II. Giles

Lecture—2 hours. Prerequisite: Botany 120 or Entomology 100 or Environmental Toxicology 101 or Plant Pathology 125 or the equivalent. Physical aspects of agricultural pest control. Mechanical systems for safe and effective application of pest control materials. Biological, legal and environmental considerations of pest control and pesticide application. Not open for credit to students who have completed Agricultural Engineering Technology 134.

141. Technology for Agriculture in Developing Regions (3) I. Chancellor

Lecture—2 hours; laboratory/discussion—2 hours. Prerequisite: Physics 1A; upper division standing. Equipment used in tropical agriculture; man-, animal-, and engine-powered devices. Energy requirements, size-scale, costs, support infrastructure development, and productivity potentials. (Same course as International Agricultural Development 141.)

141AT. Equipment Technology for Developing Agriculture (1) I, II, III. Chancellor

Autotutorial—1 hour. Prerequisite: course 141 or International Agricultural Development 141 (may be taken concurrently). Autotutorial (slide-tape) presentation of machinery, irrigation, and marine equipment technology applications, operation, and maintenance. (P/NP grading only.)

145. Field Equipment Technology (2) III. J. Rumsey

Lecture—1 hour; laboratory—3 hours. Prerequisite: upper division standing and Physics 1A or 5A. Function, construction, and operating principles of field equipment for harvesting fruit, nut, vegetable, and field crops. Principles of operation and construction of hydraulic systems. Function and application of pumps, motors, and valves for controlling field equipment.

147. Field Equipment Management (2) I, II, III. J. Rumsey

Lecture—1 hour. Prerequisite: course 49 (may be taken concurrently) or consent of instructor. Fundamentals of field machinery management to include machinery capacity, selection from capacity and economic standpoints, scheduling, acquisition options, and trade-in considerations. Estimation of operating costs of farm machinery. Not open for credit to students who have completed Agricultural Engineering Technology 105.

161. Water Quality Management for Aquaculture (3) II. Piedrahita

Lecture—3 hours. Prerequisite: Biological Sciences 1B, Mathematics 16B, Chemistry 2B. Basic principles of water chemistry and water treatment processes as they relate to aquacultural systems. Not open for credit to students who have completed Agricultural Engineering Technology 161A.

163. Aquaculture Systems Engineering (3) III. Piedrahita

Lecture—3 hours. Prerequisite: course 161. Design of aquacultural systems: design methodology, principles of fluid mechanics, site selection and facility planning, management operations, computer modeling. Not open for credit to students who have completed Agricultural Engineering Technology 161B.

165. Irrigation Practices for an Urban Environment (2) III. Hills

Lecture—2 hours. Prerequisite: Physics 1A or 5A. Basic design, installation, and operation principles of irrigation systems for turf and landscape: golf courses, parks, highways, public buildings, etc. Emphasis on hardware association with sprinkler and drip/trickle systems. Not open for credit to students who have completed Agricultural Engineering Technology 143.

170. Design in Biological Systems Technology (3) II. Miles. Steinke

Lecture—2 hours; laboratory—3 hours. Prerequisite: Physics 1A or 5A and course 15, 16, or 17. Introduction and application of design procedures and tools. Techniques are presented for solving design problems and selecting appropriate material. Catalog and

handbook utilization, government safety regulations, and environmental considerations are discussed.

190C. Research Conference for Advanced Undergraduates (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: consent of instructor. Research conferences for specialized study in applied biological systems technology. May be repeated for credit. (P/NP grading only.)

192. Internship in Applied Biological Systems

Technology (1-5) I, II, III. The Staff (Hills in charge) Internship—3-15 hours. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised internship in applied biological systems technology. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Hills in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Hills in charge)

(P/NP grading only.)

Graduate Courses

233. Advanced Pest Control Practices (3) II. Giles Lecture—2 hours; laboratory—3 hours. Prerequisite: introductory class in entomology, plant pathology, weed science or similar discipline. Practical and theoretical considerations of pest control systems and techniques. Design, selection and use of mechanical systems for field, orchard, greenhouse and vector control use. Biological, legal and environmental considerations in pest control and pesticide application. Not open for credit to students who have completed Agricultural Engineering Technology 233.

290C. Graduate Research Conference

(1) I, II, III. The Staff Discussion—1 hour. Prerequisite: consent of instructor. Research problems, progress, and techniques in applied biological systems technology. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Hills in charge)

299. Research (1-12) I, II, III. The Staff (Hills in charge) (S/U grading only.)

Professional Course

317. Teaching Agricultural Mechanics (2)

II. J. Rumsey Lecture—1 hour; laboratory—3 hours. Prerequisite: a course in physics; 6 units related to agricultural mechanics; enrolled in Agricultural Education Teacher Credential Program. Preparation of the teacher to plan, organize, and conduct an agricultural mechanics program in secondary schools. Development of and presentation of lesson plans and teaching aids. Review of subject matter in metal fabrication, power and machinery and agricultural structures areas. Not open for credit to students who have completed Agricultural Engineering Technology 317.

Applied Mathematics (A Graduate Group)

Arthur J. Krener, Ph.D., Chairperson of the Group
Group Office, 570 Kerr Hall (916-752-8131)

Faculty. Consists of members from a variety of departments whose research interests are mathematically oriented. Departments represented include Biological Sciences; Chemistry; Engineering: Computer Science, Chemical and Materials Science, Civil and Environmental, Electrical and Computer, and Mechanical and Aeronautical; Environmental Studies; Epidemiology and Preventive Medicine; Evolution and Ecology; Land, Air and Water Resources; Management; Mathematics; Physics; Radiology; Statistics; and Wildlife and Fisheries Biology.

Graduate Study. Students prepare for careers relating to the application of mathematics to problems in the physical and life sciences, engineering, and management. The degree requirements consist of rigorous training in applied mathematics, including coursework and a research dissertation under the direction of a member of the Applied Mathematics Graduate Group. The M.S. degree provides preparation (1) for further study in applied mathematics or an application area, or (2) for a career in industry or public service. The Ph.D. degree provides preparation for a career in research and/or teaching. Areas of research in the program include differential equations, fluid mechanics, numerical analysis, operations research, systems theory, probability and stochastic processes, mathematical biology, and mathematical physics. Detailed information may be obtained by writing to the Graduate Coordinator, Department of Mathematics.

New applicants are admitted to the fall quarter *only*.

Preparation. The program encourages application from students who have prior training in engineering, physical and life sciences, mathematics, economics, and related fields. Applicants must have completed two years of undergraduate mathematics including linear algebra, differential equations, and vector calculus. A rigorous course in advanced calculus is strongly encouraged.

Graduate Advisers. A. Cheer (Mathematics); T. Nathan (Land, Air, and Water Resources).

Applied Physics

See Physics

Aquaculture

See Animal Science; Applied Biological Systems Technology; and Wildlife and Fisheries Biology

Art History

(College of Letters and Science)

Mary H. Fong, Ph.D., Director, Program in Art History
Department Office, 111A Art Building
(916-752-0105)

Faculty

Mary H. Fong, Ph.D., Professor
Robert J. Grigg, Ph.D., Associate Professor
Dianne Sachko Macleod, Ph.D., Associate Professor
Jeffrey Ruda, Ph.D., Associate Professor

Emeriti Faculty

Daniel J. Crowley, Ph.D., Professor Emeritus
Seymour Howard, Ph.D., Professor Emeritus

The Major Program

Art History is the study of the visual arts in civilization. It examines changing aesthetic and cultural values and significant material and ideological developments as seen in works of art and architecture. It emphasizes visual as well as verbal intelligence, providing more than the standard advantages of liberal arts training.

The Program. The student majoring in art history begins with courses which survey the arts of Asia, Europe, and America. More specialized courses fol-

low in ancient, Byzantine, medieval, Renaissance, baroque, modern, Non-Literate, Oriental, and American art and architecture. At the same time students are encouraged to take classes in related disciplines such as religion, history, philosophy, literature, and foreign languages.

Career Alternatives. The major prepares students for advanced study either in graduate school, or in professional programs. It can also serve as the foundation for careers in teaching, research, museums, galleries, arts administration, art criticism, publishing, and art investment.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	20
Three courses selected from Art History 1A, 1B, 1C, 1D.....	12
One art studio course in drawing, printmaking, painting, or photography.	4
One art studio course in sculpture or ceramics	4
Depth Subject Matter	36
Nine upper division art history courses, which must be taken in at least four of the following five areas.....	36
(a) Ancient/Medieval/Northern Renaissance	
(b) Southern Renaissance/Baroque	
(c) Modern	
(d) China/Japan	
(e) Non-Literate	
Total Units for the Major	56

Minor Program Requirements:

	UNITS
Art History	20
Five upper division art history courses (one lower division substitute course permissible)	20
Courses must be chosen from at least three of the following subject areas with no more than two courses in any single area:	
(a) Ancient/Medieval/Northern Renaissance	
(b) Southern Renaissance/Baroque	
(c) Modern	
(d) China/Japan	
(e) Non-Literate	

Honors Program. An Honors Program is available to Art History majors who are seriously considering attending graduate school. To be eligible for the program, a student must have a grade-point average of 3.7 in the major. In addition to meeting the standard major requirements, the honors student completes one quarter of language in German or Chinese, one seminar (courses 190 or 198), and writes an honors thesis (course 194H). Students participating in this Program are candidates for Departmental recommendation for graduation with High or Highest Honors. See the Letters and Science section of this catalog and consult the department for more information.

Teaching Credential Subject Representative. Department Chairperson. See also the Teacher Education Program.

Graduate Study. The Program in Art History offers studies leading to the Master of Arts degree in History of Art as preparation for further graduate study or professional work. Further information may be obtained by writing to the Graduate Adviser or consulting the *Graduate Announcement*.

Courses in Art History (AHI)

Lower Division Courses

1A. Ancient Art (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Art of the pagan Mediterranean world from the prehistoric

caves to the fall of the Roman Empire. General Education credit with concurrent enrollment in course 1AG: Civilization and Culture.

1AG. Writing: On Ancient Art (I) I. The Staff
Discussion—1 hour; short papers. Prerequisite: course 1A (concurrently). Small group discussions and preparation of short papers for course 1A. General Education credit with concurrent enrollment in course 1A: Civilization and Culture.

1B. Medieval and Renaissance Art (4) II. Ruda
Lecture—3 hours; discussion—1 hour. Christian, Barbarian, Moslem, and Classical traditions in European Art from the fourth through the sixteenth centuries. General Education credit with concurrent enrollment in course 1BG: Civilization and Culture.

1BG. Writing: On Medieval-Renaissance Art (1) II. Ruda
Discussion—1 hour; short papers. Prerequisite: course 1B (concurrently). Small group discussions and preparation of short papers for course 1B. General Education credit with concurrent enrollment in course 1B: Civilization and Culture.

1C. Baroque and Modern Art (4) III. Mcleod
Lecture—3 hours; discussion—1 hour. Major styles and masters of the Western world after the Counter Reformation. General Education credit with concurrent enrollment in course 1CG: Civilization and Culture.

1CG. Writing: On Baroque-Modern Art (I) III. Mcleod
Discussion—1 hour; short papers. Prerequisite: course 1C (concurrently). Small group discussions and preparation of short papers for course 1C. General Education credit with concurrent enrollment in course 1C: Civilization and Culture.

***1D. Asian Art (4) I.** The Staff
Lecture—3 hours; discussion—1 hour. Introduction to the arts of Asia through a study of Oriental ink painting and architecture, Buddhist sculpture, Indian temples, Chinese ceramics, Japanese prints, and art in Mao's China. General Education credit with concurrent enrollment in course 1DG: Civilization and Culture.

***1DG. Writing: On Asian Art (I) I.** The Staff
Discussion—1 hour; short papers. Prerequisite: course 1D (concurrently). Small group discussions and preparation of short papers for course 1D. General Education credit with concurrent enrollment in course 1D: Civilization and Culture.

***25. Introduction to Architectural History (4) II.** The Staff
Lecture—3 hours; discussion—1 hour. Formal and social history of architecture, examining design principles, major traditions, and concepts of architectural history with a focus on issues in Western architecture. Emphasis on nineteenth and twentieth centuries. General Education credit with concurrent enrollment in course 25G: Civilization and Culture.

***25G. Writing: Introduction to Architectural History (1) II.** The Staff
Discussion—1 hour. Prerequisite: course 25 concurrently. Small group discussions and preparation of short papers for course 25. General Education credit with concurrent enrollment in course 25: Civilization and Culture.

98. Directed Group Study (1-5) I, II, III. The Staff (Program Director in charge)
Prerequisite: consent of instructor. Restricted to lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Program Director in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

***150. Arts of Sub-Saharan Africa (4) I, III.** The Staff
Lecture—3 hours; term paper or gallery studies and review. Traditional arts and crafts of sub-Saharan Africa; particular attention to the relationships between sculpture and culture in West and Central Africa.

151. Arts of the Indians of the Americas (4) II. The Staff
Lecture—3 hours; term paper or gallery studies and review. Development of art in North America, emphasizing ancient Mexico. South American relationships and parallels. Recent and contemporary Indian arts and crafts from Alaska to Chile.

152. Arts of Oceania and Prehistoric Europe (4) III. Crowley
Lecture—3 hours; term paper. Traditional arts of aboriginal Australia, Melanesia, Polynesia, and Micronesia, as seen in their cultural contexts. Prehistoric art of Europe and the Near East.

154A. Early Greek Art and Architecture (4) III. The Staff
Lecture—3 hours; gallery study and term paper. Prerequisite: upper division standing. Examination of history and significance of major monuments in Greek art and architecture from the Homeric, Geometric Age to the Golden Age and the death of Socrates.

***154B. Later Greek Art and Architecture (4) III.** The Staff
Lecture—3 hours; gallery studies and term paper. Prerequisite: upper division standing. Examination of the history and significance of monuments in Greek art and architecture from the Silver Age of Aristotle to Alexander to the end of the Hellenistic Age and the death of Cleopatra.

***155. Roman Art (4) III.** The Staff
Lecture—3 hours; term paper or gallery studies and review. The art of Republican and Imperial Rome.

163A. Chinese Art (4) II. Fong
Lecture—3 hours; term paper or gallery studies and review. A survey from the beginning to the twelfth century focusing on the major art forms that are traditionally known as well as newly discovered through archaeology in China.

***163B. Chinese Painting (4) III.** Fong
Lecture—3 hours; term paper or gallery studies and review. The unique form of ink painting, with or without colors, depicting human and animal figures, flowers-and-birds, and landscape—the favorite and enduring theme of the Chinese scholar-painter.

163C. Painting in the People's Republic of China (4) III. Fong
Lecture—3 hours; term paper. Prerequisite: course 1D or upper division standing. Analysis of the interaction between art and politics in the emergence of China into the modern world. Integration of Western influence, implementation of Mao Zedong's thought on art, and the formation of contemporary Chinese painting.

***164. The Arts of Japan (4) III.** The Staff
Lecture—3 hours; term paper and/or gallery studies and review (determined by instructor each quarter course offered). Study of the significant achievements in architecture, painting, sculpture, and decorative arts from prehistoric age to nineteenth century.

***168. Great Cities (4) I.** The Staff
Lecture—3 hours; term paper. Transformation in architecture and urban form in Paris, London, and Vienna in the context of varying social, political, and economic systems as well as very different cultural traditions, concentrating on the years 1830-1914. Offered in alternate years.

176A. Art of the Middle Ages: Early Christian and Byzantine Art (4) I. Grigg
Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture of the early Christian era and Byzantine Empire: through the later Roman Empire in the West and to the final capture of Constantinople in the East.

***176B. Art of the Middle Ages: Early Medieval and Romanesque Art (4) III.** Grigg
Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture of western Europe in the early medieval era: from the rise of the barbarian kingdoms through the twelfth century.

***176C. Art of the Middle Ages: Gothic (4) II.** Grigg
Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture in northern Europe from the twelfth through the fifteenth centuries.

***177A. Northern European Art (4) III.** Grigg
Lecture—3 hours; term paper or gallery studies and review. Painting and sculpture of the fifteenth century in Austria, Germany, France and the Lowlands, including such artists as Jan van Eyck and Hieronymus Bosch.

***177B. Northern European Art (4) I.** Grigg
Lecture—3 hours; term paper or gallery studies and review. Painting and sculpture of the sixteenth century in Germany, France and the Lowlands, including such artists as Albrecht Dürer and Pieter Bruegel.

178A. Italian Renaissance Art (4) I. Ruda
Lecture—3 hours; term paper or gallery studies and review. Giotto and the origins of the Renaissance; painting and sculpture in Italy from Nicola Pisano through Lorenzo Monaco, with emphasis on Duccio, Giotto, and other leading artists of the early fourteenth century.

***178B. Italian Renaissance Art (4) II.** Ruda
Lecture—3 hours; term paper or gallery studies and review. Early Renaissance in Florence; fifteenth-century artists from Donatello and Masaccio through Botticelli, in their artistic and cultural setting.

178C. Italian Renaissance Art (4) III. Ruda
Lecture—3 hours; term paper or gallery studies and review. The High Renaissance: Leonardo, Michelangelo, Raphael, and Titian in their artistic and cultural settings—Florence, Rome, and Venice in the early sixteenth century. General Education credit: Civilization and Culture.

179B. Baroque Art (4) III. Ruda
Lecture—3 hours; term paper or gallery studies and review. Seventeenth-century painting, including such artists as Caravaggio, Rubens, Rembrandt, and Velázquez. Offered in alternate years.

***182. British Art (1750-1914) (4) III.** Macleod
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1C. Analysis of the place of art in British culture—1750 to 1914. Topics include influence of class and gender on art education, patronage, and exhibition societies. Artists: Hogarth, Turner, Pre-Raphaelites, and lesser-known advocates of military, social realist, and colonial themes.

***183A. Art in the Age of Revolution (4) I.** Macleod
Lecture—3 hours; discussion—1 hour. Prerequisite: at least one course in art or consent of instructor. Analysis of political and stylistic implications of European painting from 1750 to 1860. Artists studied include Goya, David, Delacroix, Constable, Turner, the Pre-Raphaelites, and Courbet.

183B. Impressionism and Post-Impressionism (4) II. Macleod
Lecture—3 hours; discussion—1 hour. Prerequisite: at least one course in art or consent of instructor. Social and cultural study of major European art movements between 1860 and 1900, including an examination of the paintings of Manet, Monet, Renoir, Whistler, Gauguin, van Gogh, Cezanne, and Redon.

***183C. Modern Art: 1900-1945 (4) I.** Macleod
Lecture—3 hours; discussion—1 hour. Prerequisite: at least one course in art or consent of instructor. Examination of modern movement in European art from Fauvism and Cubism to Surrealism and Abstract Expressionism (1900-1945). Artists studied include Picasso, Matisse, Kandinsky, Malevich, and Pollock.

***183D. Modern Sculpture (4) III.** The Staff
Lecture—3 hours; term paper or gallery studies and review. Sculpture from Neo-Classicism to the present.

183E. Contemporary Art: 1945 to the Present (4) I. Macleod
Lecture—3 hours; discussion—1 hour. Prerequisite: at least one course in art or consent of instructor. Painting and sculpture in Europe and America from 1945 to the present, with emphasis on the New York school, Pop art, Op art, Earthworks, and Feminist art.

***184. Twentieth Century Architecture (4) III.** The Staff
Lecture—3 hours; term paper. Prerequisite: course 25 recommended. Major movements in architecture of the twentieth century in Europe and America. Formal innovations are examined within the social, political, and economic circumstances in which they emerged.

***188B. Architecture of the United States (4) II.** The Staff

Lecture—3 hours; term paper. Prerequisite: course 25 recommended. American architecture from the first European settlers to Postmodernism. Technological and formal developments will be examined within the social, political, and economic context in which they emerged. Issues include ideals of domesticity and the development of the architectural profession.

188C. Painting of the United States (4) II. McLeod
Lecture—3 hours; discussion—1 hour; term paper or gallery studies and review. American pictorial development from 1650 to the present, with emphasis on twentieth-century developments.

***190. Undergraduate Seminar (4) II.** The Staff (Program Director in charge)

Lecture—3 hours; term paper. Prerequisite: consent of instructor. Intended primarily for senior and junior students in the history of art. Assigned readings, discussions, and a substantial paper in a particular area of art history will introduce the student to methodology and techniques of art historical research. May be repeated once for credit. Limited enrollment.

192. Internship (2-12) I, II, III. The Staff (Program Director in charge)

Internship—term paper or catalogue. Supervised program of internships at professional art institutions such as museums, galleries, and art archives including collections of slides and photographs. May be repeated once for credit. (P/NP grading only.)

194H. Special Study for Honor Students (4) I, II, III. The Staff

Independent study—12 hours. Prerequisite: course 190 or the equivalent, as determined by the major adviser. Open only to students in the Art History Honors Program. Independent study of an art historical problem culminating in the writing of an honors thesis under the supervision of a faculty guidance committee.

198. Directed Group Study (1-5) I, II, III. The Staff (Program Director in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Program Director in charge)

(P/NP grading only.)

Graduate Courses**200. Introduction to Art Historical Research (4) I.** The Staff

Seminar—4 hours. Introductory sampling of major writings, methods, and sources used for research in the discipline of art history.

***250. Problems in Art Historical Research (4) III.** The Staff

Seminar—3 hours; term paper. Major topics in art historical research, emphasizing special methods of investigation, and of historical and critical analysis. May be repeated for credit.

***251. Seminar in Tribal Arts (4) II.** The Staff
Seminar—3 hours; term paper. Selected topics in the art and aesthetics of small scale societies. May be repeated for credit when topic differs and with consent of instructor.

***254. Seminar in Classical Art (4) III.** The Staff
Seminar—3 hours; term paper. Selected areas of special study in classical art of the Greek and Roman tradition. Course may be repeated for credit with consent of instructor.

263. Seminar in Chinese Art (4) II. Fong
Seminar—3 hours; paper. Selected areas of special study in Chinese Art. May be repeated for credit with consent of instructor.

***276. Seminar in Medieval Art (4) III.** Grigg
Seminar—3 hours; term paper. Selected areas of special study in medieval art from Early Christian to late Gothic. May be repeated for credit with consent of instructor.

278. Seminar in Italian Renaissance Art (4) II. Ruda

Seminar—3 hours; term paper. Selected areas of special study in Italian art from the fourteenth to the sixteenth century. May be repeated for credit with consent of instructor.

283. Seminar in Modern European Art (4) III. Macleod

Seminar—3 hours; term paper. Selected areas of special study in art since 1800 in Europe. May be repeated for credit with consent of instructor.

***288. Seminar in European and American Architecture (4) II.** The Staff

Seminar—3 hours; term paper. Exploration of selected topics in European and American architectural history with concentration on the Modern Period. May be repeated for credit with consent of instructor.

299. Individual Study (1-6) I, II, III. The Staff (Program Director in charge)

(S/U grading only.)

Professional Course**390. Introduction to Teaching Art History for Teaching Assistants (1) I, II, III.** The Staff

Discussion—1 hour. Designed for teaching assistants with emphasis on problems and procedures encountered by teachers of undergraduate art history. (S/U grading only.)

Professional Courses**401. Museum Training: Curatorial Principles (4) II.** Amerson

Seminar—3 hours. Approved for graduate degree credit. Study of private and public collections. Museum personalities. Appraisal of works of art; ethics of appraisal. Auction and sales: methods and catalogues. Registration. Technical problems of the museum. Connoisseurship. Collateral reading. Visits to museums. Seminar with assigned papers.

***402. Museum Training: Exhibition Methods (4) II.** Amerson

Seminar—3 hours; exhibition. Approved for graduate degree credit. History of exhibition methods in private and public collections. Comparisons of different types of museums and their exhibition problems. Lighting and techniques of display with emphasis on actual design. Experimentation with unusual presentation forms.

Note: Various of the above courses are not offered each year; please check the quarterly Class Schedule and Room Directory.

Art Studio

(College of Letters and Science)

Conrad Atkinson, R.A.S. (honors), Chairperson of the Department

Department Office, 111A Art Building
(916-752-0105)

Faculty

L. Price Amerson, Jr., Ph.D., Lecturer
(Director, Nelson Gallery)

Conrad Atkinson, R.A.S. (honors), Professor

Squeak Carnwath, M.F.A., Professor

William Henderson, M.F.A., Professor

Lynn Hershman, M.A., Professor

Harvey Himelfarb, M.A., Professor, *Academic Senate*

Distinguished Teaching Award

David Hollowell, M.F.A., Associate Professor

Lucy A. Puls, M.F.A., Associate Professor

Irit Rogoff, Ph.D., Associate Professor

Cornelia Schulz, M.F.A., Professor, *Academic Senate*

Distinguished Teaching Award

Baochi Zhang, M.F.A., Assistant Professor

Emeriti Faculty

Richard D. Cramer, M.F.A., Professor Emeritus

Roy DeForest, M.A., Professor Emeritus

Roland C. Petersen, M.A., Professor Emeritus

Wayne Thiebaud, M.A., hon. D.F.A. (C.C.A.C., D.C.)

Professor Emeritus, *UC Davis Prize for Teaching and Scholarly Achievement*

The Major Program

The studio art major provides the knowledge and experience necessary for a broad understanding of the visual arts.

The Program. For the beginning student, the major offers an introduction to drawing, composition, sculpture, and art history. Students may then advance to more specialization (painting, sculpture, printmaking, ceramics, photography, film making, as well as theory and criticism) in upper division work.

Portfolios. Students at Davis should keep a continuing portfolio of their art work which is subject to faculty perusal at such times as when the student is declaring the major, trying to add the first day of class (the department gives preference to students who have pre-enrolled), requesting independent study courses, and scheduling an exhibition in the student gallery.

Career Alternatives. The studio art graduate is prepared for graduate work or continuing development as a professional artist or art teacher. Students who have career aspirations in the commercial aspects of the visual arts can acquire a broad general education and a creative foundation in the art studio major, establishing a basis for further specialization in commercial art.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	20
Three courses from Art Studio 2, 3, 4, 5, 16; see prerequisites required for upper division courses	12
Two courses from Art History 1A, 1B, 1C, 1D	8
Depth Subject Matter	36
Six courses, under three different instructors, chosen from Group A, Practice of Art ...	24
One course from Group B, Theory and Criticism	4
Two upper division courses in art history	8
Total Units for the Major	56

Recommended

- Students interested in drawing and painting should take Art Studio 2, 3, 4 (course 5 is recommended);
- Students interested in sculpture should take Art Studio 2, 3, 5 (course 4 is recommended); and
- Students preparing for graduate work in any of the environmental design professions should take Art Studio 2, 5, 16.

Major Advisers. See the *Class Schedule and Room Directory*.

Minor Program Requirements:

	UNITS
Art Studio	20
Upper division art studio courses chosen in consultation with a faculty adviser (one lower division substitute course permissible)	20
Prerequisite courses must be taken prior to enrollment in upper division courses. Independent study courses are not applicable.	

Teaching Credential Subject Representative. Department Chairperson. See also the Teacher Education Program.

Graduate Study. The Department of Art offers programs of study and research leading to the M.F.A. degree in the practice of art. Detailed information regarding graduate study may be obtained from the Graduate Admissions Office or the Art Office.

Courses in Art Studio (ART)

Lower Division Courses

2. Drawing I (4) I, II, III. Henderson, Carnwath and staff
Laboratory—8 hours; to be arranged—4 hours. Form and composition in black and white.

3. Drawing II (4) I, II, III. Carnwath, Schulz, Thiebaud Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 2. Form and composition in color.

4. Life Drawing (4) I, III. Hollowell, Schulz Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 2. Form in composition using the human figure as subject.

5. Sculpture (4) I, II, III. Puls, Zhang Laboratory—8 hours; to be arranged—4 hours. Form in space using plaster and other media.

***10S. Introduction to Art Appreciation (4)** I. The Staff
Lecture—3 hours; term paper or gallery studies and review. Understanding and appreciation of painting, sculpture, architecture, and industrial art. Illustrated lectures. Intended for students not specializing in art. (P/NP grading only.)

16. Descriptive Drawing (4) I. Hollowell Laboratory—8 hours; to be arranged—4 hours. Objective drawing and rendering; representations of space.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Restricted to lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

Note: Upper division courses are listed under three groups: (A) Practice of Art; (B) Theory and Criticism; (C) Special Study Courses.

Preenrollment in upper division courses is restricted to art majors. Art minors may obtain permission to pre-enroll by filling out a "Waiver of Restriction" form in the Art office.

Group A: Practice of Art

101. Painting: Materials and Carriers (4) I, III. Carnwath, Schulz
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Experimentation in media and their supports.

102. Painting (4) I, II, III. Schulz, Henderson, Atkinson
Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 101 or consent of instructor. Advanced painting in various media including oil and polymers. May be repeated once for credit with consent of instructor.

103. Advanced Drawing (4) I. Henderson
Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 2, 3, 4, 16, or consent of instructor. Advanced drawing, composition and form in black and white and color. May be repeated once for credit with consent of instructor.

104. Figure Drawing and Painting (4) II, III. Schulz, Zhang
Laboratory—12 hours. Prerequisite: courses 4 and 101, or consent of instructor. Advanced figure drawing and painting using the human figure as subject. May be repeated once for credit with consent of instructor.

110. Photography I (4) I, II. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, or consent of instructor. Photography as an art form. Experiments with camera and light sensitive materials.

111. Photography II (4) III. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 110 or consent of instructor. Art of camera and light sensitive materials: tonal control, multiple exposure, synthetic negatives, etc. May be repeated once for credit with consent of instructor.

113. Interdisciplinarity (4) II. Hershman
Studio—8 hours. Prerequisite: one course in Art History or Art Studio. Focus on the uses of two or more art forms to make a unique art work; also, ideas of collaboration and reconfigured and integrated forms as new methods of expression that do not solely depend on unique authorship.

114. Identity and Technology (4) II. Hershman
Studio—8 hours; independent study—1 hour. Prerequisite: one course in Art History or Art Studio. The notion of "self", "portraiture" and "identity" as it is defined in an electronic world in which media alters perceptions of belief as individuals and society. Hands-on projects plus theoretical analysis of media.

***115. Film-making I (4)** I. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, or consent of instructor. Film-making as an art form; 8 and 16 mm. cameras and sound track. May be repeated once for credit with consent of instructor.

116. Video Practice and Theory (4) I. Hershman
Studio—8 hours; independent study—1 hour. Prerequisite: 12 units of lower division art studio classes. Production techniques of video, including shooting, editing, lighting, sound and effects. A conceptual framework for video-art techniques.

117. Experimental Documentary (4) III. Hershman
Studio—8 hours; independent study—1 hour. Prerequisite: upper division standing. Study of the documentary form with particular attention to hybrid forms of film, video and computer genres. May be repeated once for credit with consent of instructor when topic differs.

***120. Intermedia Art (4)** III. Zhang
Studio—8 hours; independent study—1 hour. Prerequisite: three courses chosen from the following: courses 2, 3, 4, 5, and 16. Use of multiple media in art-making. Human body as artistic medium. Non-traditional visual media. Problem solving on conceptual and technical levels. Visual metaphors, narrative, intuition, meaning and expression in art. May be repeated once for credit when topic differs and with consent of instructor.

125. Printmaking: Relief (4) II. Carnwath
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Woodcut, linocut, metal-plate relief and experimental uses of other materials.

126. Printmaking: Intaglio (4) I. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Metal plate etching, aquatint, hard- and soft-ground, burin engraving and related methods. May be repeated once for credit with consent of instructor.

127. Printmaking: Lithography (4) III. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Stone and metal-plate lithography and other planographic methods. May be repeated once for credit with consent of instructor.

***128. Printmaking: Serigraphy (4)** III. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Silk screen and related stencil methods. May be repeated once for credit with consent of instructor.

141. Sculpture: Material Explorations (4) I. Puls
Studio—8 hours; independent study—1 hour. Prerequisite: course 5. Primary application and exploration of a single sculptural material. Examination of its properties, qualities and characteristics for three dimensional expression. May be repeated twice for credit in different subject area with consent of instructor.

142. Sculpture: Ceramics I (4) I. Zhang
Laboratory—8 hours; 1 hour to be arranged. Prerequisite: course 2, 3, 4 and 5, or consent of instructor. Introduction to ceramic forms and processes.

143. Sculpture: Ceramics II (4) II. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 142 or consent of instructor. Introduction to color, as well as glazing and use of kiln. May be repeated once for credit with consent of instructor.

***144. Sculpture: Figure Modeling (4)** II. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Sculpture in various media using the human figure as subject. May be repeated once for credit with consent of instructor.

145. Sculpture: Concepts (4) II. Puls
Studio—8 hours; independent study—1 hour. Prerequisite: course 5 or consent of instructor. Investigation through the creation of sculpture of the relationship of idea to form and material. May be repeated once for credit in different subject area with consent of instructor.

146. Sculpture: Ceramics III (4) III. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 141, 143, 144, or 145. Advanced form and color. Clay sculpture in relief and round. May be repeated once for credit with consent of instructor.

Group B: Theory and Criticism

***147. Theory and Criticism of Photography (4)** III. Himelfarb
Lecture—3 hours; term paper. Prerequisite: course 2 or 5 and one art lecture course. Development of camera vision, ideas, and aesthetics and their relationship to the fine arts from 1839 to the present.

148. Theory and Criticism: Painting and Sculpture (4) II. Thiebaud
Lecture—3 hours; term paper. Prerequisite: course 2 or 5, and one art lecture course. Study of forms and symbols in historic and contemporary masterpieces.

149. Introduction to Critical Theory (4) I. Rogoff
Lecture—3 hours; discussion—1 hour. Prerequisite: two of Art History 1B, 1C, or 183F. An overview of 20th century critical theories of culture and their relation to visual art and mass media culture.

150. Theory and Criticism of Electronic Media (4) III. Hershman
Lecture—3 hours; term paper. Prerequisite: course 116 or 117. The history of electronic media, stressing both critique, application and relationship to art practice. Analysis of the conceptual biases of electronic media as an artistic mode of expression.

Group C: Special Study Courses

192. Internship (2-12) I, II, III. The Staff (Chairperson in charge)
Internship—term paper or catalog. Supervised program of internships at professional art institutions such as museums, galleries, and art archives including collections of slides and photographs. May be repeated once for credit. (P/NP grading only.)

***193. Seminar in Art Practice (4)** I, II, III. The Staff (Chairperson in charge)
Discussion-laboratory—8 hours; variable—4 hours. Prerequisite: courses 2 and 3; upper division standing: taking or having taken courses in upper division drawing, painting, and sculpture. Work (painting, sculpture, drawing, etc.) done for group discussion and criticism, as well as group discussion of contemporary topics in the visual arts. May be repeated once for credit.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201. Experiments in Art and Visual Communication (4) I, II, III. The Staff
Lecture—3 hours. Original work produced for class discussion and criticism. May be repeated for credit.

290. Seminar (4) I, II, III. Puls, Rogoff, Hershman and staff
Seminar—3 hours. Original works produced for group discussion and criticism; associated topics of a contemporary and historical nature. May be repeated for credit.

291. Seminar: Critical Evaluation (1) II. The Staff (Graduate Adviser in charge)
Seminar—1 hour. May be repeated for credit. (S/U grading only.)

292. Seminar: Comprehensive Qualifying (1) I. The Staff (Graduate Adviser in charge)
Seminar—1 hour. Further critical evaluation of the student's work to determine his eligibility to begin the Comprehensive Project. May be repeated for credit. (S/U grading only.)

299. Individual Study (1-6) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Comprehensive Project (9) III. The Staff
(Graduate Adviser in charge)

An original body of work accompanied by a catalog summarizing the student's aesthetic position. May be repeated for credit. (S/U grading only.)

Professional Courses

401. Museum Training: Curatorial Principles (4) II. Amerson

Seminar—3 hours; papers. Approved for graduate degree credit. Study of private and public collections. Museum personalities. Appraisal of works of art; ethics of appraisal. Auction and sales: methods and catalogues. Registration. Technical problems of the museum. Connoisseurship. Collateral reading. Visits to museums.

***402. Museum Training: Exhibition Methods** (4) II. Amerson

Seminar—3 hours; exhibition. Approved for graduate degree credit. History of exhibition methods in private and public collections. Comparisons of different types of museums and their exhibition problems. Lighting and techniques of display with emphasis on actual design. Experimentation with unusual presentation forms.

Note: Various of the above courses are not offered each year; please check the quarterly Class Schedule and Room Directory.

Asian American Studies

(College of Letters and Science)

Isao Fujimoto, M.A., Program Director

Program Office, 3102 Hart Hall (916-752-3625)

Committee in Charge

Roy H. Doi, Ph.D. (*Molecular and Cellular Biology*)

Isao Fujimoto, M.A. (*Applied Behavioral Sciences*)

Wendy A. Ho, Ph.D. (*Asian American Studies, Women's Studies*)

Peter C.Y. Leung, M.S. (*Asian American Studies*)

Kent Ono, Ph.D. (*Rhetoric and Communication*)

Keith H. Osajima, Ph.D. (*Asian American Studies, Education*)

Beatriz Pesquera, Ph.D. (*Chicana/o Studies*)

Diane Wolf, Ph.D. (*Sociology*)

Faculty

Wendy A. Ho, Ph.D., Assistant Professor

Peter C.Y. Leung, M.S., Senior Lecturer

Keith H. Osajima, Ph.D., Assistant Professor

Program of Study. Currently, Asian American Studies does not offer a major. A minor program, Asian American Studies, is available to students interested in this field of study.

American History and Institutions. This University requirement can be satisfied by one of the following courses in Asian American Studies: 1, 2. (See also under University requirements.)

Related Courses. For courses in Asian languages, see Cantonese (below) and Chinese and Japanese. For other Asian courses, see Chinese and Japanese, and East Asian Studies.

Minor Program Requirements:

UNITS

Asian American Studies20

Asian American Studies 100, 1108

An additional three courses from Asian American Studies 101, 111, 112, 130, 136, 150, 192 (No more than 4 units of 192 may be counted toward this total)12

Minor Adviser. P.C.Y. Leung

Courses in Asian American Studies (ASA)

Direct questions pertaining to the following courses to the instructor or to Asian American Studies Program, 3102 Hart Hall (916-752-3625).

Lower Division Courses

1. Historical Experience of Asian Americans (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Introduction to Asian American Studies through an overview of the history of Asians in America from the 1840s to the present within the context of the development of the United States.

2. Contemporary Experience of Asian Americans (4) I, III. The Staff

Lecture—3 hours; discussion—1 hour. Introduction to Asian American Studies through analysis of relationships between ethnicity, race, and culture. Identity development of Asian Americans and their communities in the context of contemporary American institutional practices.

***20. Calligraphic Expression in Asian American Culture** (3) II. Leung

Lecture—2 hours; studio—3 hours. Survey the legacy of calligraphy in Asian American families, festivals, temples, and schools. Understanding and appreciation of calligraphy through some basic writing. Trace origins, principles and styles of Chinese and Japanese calligraphy. Offered in alternate years.

92. Internship (1-3) I, II, III. The Staff (Director in charge)

Internship—3-9 hours. Prerequisite: enrollment dependent on availability of intern positions and consent of instructor. Supervised internship in community and institutional settings related to Asian American concerns. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Director in charge)

Primarily intended for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III

The Staff (Director in charge)

(P/NP grading only.)

Upper Division Courses

100. Asian American Communities (4) II. The Staff

Lecture/discussion—4 hours. Prerequisite: course 110. Study of historical and contemporary experiences of various Asian American groups, with the community as the unit of analysis.

101. Language and Educational Issues of Asian Immigrants (4) I. Osajima

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2; upper division standing. Analysis of language diversity issues in American society, especially in public schools. Overview of public policies on language and programs, particularly for Asian language minority students. Offered in alternate years.

110. Theoretical Perspectives in Asian American Studies (4) I. The Staff

Lecture/discussion—4 hours. Prerequisite: course 1 or 2; upper division standing. Theories of race and ethnic relations as tools for understanding the Asian American experience with the society as the unit of analysis.

111. Ethnic Self and Identity (4) III. Osajima

Lecture/discussion—4 hours. Prerequisite: course 101. Study of cultural and social psychological influences on Asian Americans, with the individual as the unit of analysis.

112. Asian/Pacific American Women (4) II. Ho

Lecture/discussion—4 hours. Prerequisite: course 1 or 2; upper division standing. Examination of the cultural, social, and political situation of Asian and Pacific American women using theoretical perspectives from social science disciplines: socialization, family dynamics, domestic and political power, economic production, and division of labor.

130. Asian American Literature (4) III. Ho

Lecture/discussion—4 hours. Prerequisite: course 1 or 2, or consent of instructor. Analysis of Asian Amer-

ican writings as expressions of various cultural themes, psychological issues, interpersonal relationships and sociopolitical influences on the Asian American experience.

***136. Asian American Drama** (4) III. Ho

Lecture/discussion—4 hours. Prerequisite: courses 1, 2, or 130; or consent of instructor. Comparative introduction to the dramatic literature of Asian American playwrights such as Frank Chin, Philip Kan Gotanda, Velina Hasu Houston, David Henry Hwang, Wakako Yamauchi, and others from diverse socio-historical, artistic, and theoretical contexts.

150. Filipino American Experience (4) I. The Staff

Lecture/discussion—4 hours. Prerequisite: course 1 or 2. Examination of the relationship between the Filipino-American community, the Philippine home community and the larger American society through a critical evaluation of the historical and contemporary conditions, problems and prospects of Filipinos in the U.S.

***155. Legal History and the Asian American** (4) I. The Staff

Lecture/discussion—4 hours. Prerequisite: course 1 or 2; consent of instructor. Legal history of Asian Americans beginning with the experience of Chinese Americans in the mid-19th century. Includes an examination of laws affecting Asian American communities in immigration, economic activities, and World War II internment.

192. Internship (1-5) I, II, III. The Staff (Director in charge)

Internship—3-15 hours. Prerequisite: enrollment dependent on availability of intern position with priority to Asian American Studies minors. Supervised internship in community and institutional settings related to Asian American concerns. (P/NP grading only.)

197T. Tutoring in Asian American Studies (1-5) I, II, III. The Staff (Director in charge)

Tutoring—1-5 hours. Prerequisite: upper division standing and completion of appropriate course with distinction; consent of instructor. Tutoring in lower division Asian American Studies courses in small group discussion. Weekly meetings with instructor. May be repeated for credit once for a given course and also for a different course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Director in charge)

Prerequisite: consent of instructor. Primarily intended for upper division students. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Director in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Courses in Cantonese (CAN)

Lower Division Courses

1-2-3. Elementary Cantonese (5-5-5) I-II-III. Leung

Lecture—3 hours; recitation—3 hours. Introduction to Cantonese grammar and development of conversational skills in a cultural context. Approximately 250 Chinese characters will be introduced during Cantonese 2 and 3. (Not open to native speakers.)

4-5-6. Intermediate Cantonese (3-3-3) I-II-III. Leung

Lecture—2 hours; recitation—2 hours. Prerequisite: course 1-2-3 or the equivalent. Development of conversational skills in a cultural context. Community-oriented language materials in health care, social service, and bilingual education will be introduced.

Asian Studies

See Asian American Studies;
and East Asian Studies

Astronomy

See Physics

Atmospheric Science

(College of Agricultural and Environmental Sciences)

Faculty. See under Department of Land, Air and Water Resources.

The Major Program

Atmospheric science is the study of the layer of air that surrounds the planet. It includes all weather phenomena, such as frontal systems and clouds, as well as severe weather events such as hurricanes and tornadoes. Concerns regarding the effects of human activity on the quality of the air we breathe, and on possible global warming are also central to this field of study.

The Program. Modern meteorology is a quantitative science that is becoming increasingly computer oriented. In addition to the study of daily weather events, the program deals with fundamental physical processes that involve the general circulation of the atmosphere; mass and energy transfers at the planetary surface and within the atmosphere; solar and terrestrial radiation; atmospheric interaction with the biosphere; climate variations; air pollution meteorology; and developments in modern meteorological instrumentation. As well as providing a broad background in meteorology, the major includes an informal minor area to be chosen from mathematics, computer science, environmental studies, resource management or a physical or biological science.

Internships and Career Alternatives. Atmospheric science students have participated in internships with the California Air Resources Board, various county Air Pollution Control Districts, and the National Weather Service. Numerous career opportunities exist in the federal and state governments, research and development in the private sector, and education. Examples of career areas are weather forecasting, agricultural meteorology, air-pollution forecasting and control, weather modification, hurricane and severe weather forecasting and research, weather satellite meteorology, environmental consulting, and weather research. About half of our graduates continue their education by seeking the M.S. or Ph.D. degree in atmospheric science.

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable.)

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	62
Biological sciences (Biological Sciences 1A, plus one other course selected with adviser's approval)	8
Chemistry (Chemistry 2A, 2B)	10
Computer science (Engineering 5 or the equivalent in FORTRAN programming)	3
Mathematics (Mathematics 21A, 21B, 21C, 21D, 22A, 22B)	22
Meteorology (Atmospheric Science 60)	4
Physics (Physics 9A, 9B, 9C)	12
Statistics (Statistics 32)	3
Breadth/General Education	28
Satisfaction of General Education requirement	6-16
Additional units in social sciences and humanities to total 28 units	

Depth Subject Matter32

Atmospheric Science 110A, 110B, 120, 121A, and 121B, 124, 128.....25
Upper division Atmospheric Science courses selected with adviser's approval7
If both courses 105 and 133 are taken, only 4 units may be counted. No more than 3 units of courses 192 and 199 may be counted.

Restricted Electives21

Earth and planetary sciences (choose from Environmental Studies 116, 150A, 150B, Geography 116, 117, Geology 105, 113, 115, Environmental and Resource Sciences 103, Soil Science 100, Water Science 100, 141, or courses approved by adviser)

Unrestricted Electives29-37

Total Units for the Degree180

Major Adviser. S. Soong (*Land, Air and Water Resources*).

Advising Center for the major, as well as for graduate studies, is located in 148 Hoagland Hall, Land, Air and Water Resources Teaching Center (916-752-1669).

Graduate Study. You can specialize in particular areas of atmospheric science through graduate study and research leading to the M.S. and Ph.D. degrees. For details see under the Graduate Group in Atmospheric Science. See also the Graduate Studies section in this catalog.

Related Courses. See Environmental Studies 150A; Geography 3, 115, 116; Physics 104A, 104B; Environmental and Resource Sciences 103, 131.

Courses in Atmospheric Science (ATM)

Questions pertaining to the following courses should be directed to the instructor or to the Land, Air and Water Resources Teaching Center, 148 Hoagland Hall (916-752-1669).

Lower Division Courses

30. Issues in Atmospheric Science (2) II. Weare
Lecture—1 hour; discussion—1 hour. Prerequisite: high school physics. Introduction to selected topics in atmospheric science, such as: meteorological aspects of air pollution, use of computer models in weather forecasting, theories of global climate change, impact of satellites on meteorology, and modern meteorological instrumentation. (P/NP grading only.)

60. Atmospheric Physics and Dynamics (4) I. Soong
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16A and Physics 5A. Composition and thermal structure of the atmosphere. Radiation and the heat budget of the earth and its atmosphere. Cloud formation and precipitation processes. The atmosphere in motion, thunderstorms and other severe weather phenomena.

92. Atmospheric Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Internship off and on campus in atmospheric science. Internship supervised by a member of the faculty. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100. Severe and Unusual Weather (3) I, III. The Staff
Lecture—2 hours; discussion—1 hour. Prerequisite: Physics 10, high school physics. Extreme or unusual weather events, e.g., floods, blizzards, hurricanes, tornadoes, and desertification. Emphasis placed on scientific perspective and human context. Not intended for students majoring in the physical sciences. Not open to students who have received credit for Atmospheric Science 10. General Education credit: Nature and Environment.

110. Weather Observation and Analysis (4) III. Soong
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 60. Acquisition, distribution and analysis of meteorological data. Vertical sounding analysis, stability indices, probability of local severe weather, weather map analysis. Use of National Weather Service analyses and forecast products. Laboratory makes use of computer-generated analyses.

111. Weather Analysis and Prediction (5) I. Grotjahn
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 110, 121B, knowledge of FORTRAN (Engineering 5). Introduction to the tools used for analyzing and predicting mid-latitude weather systems. Quasi-geostrophic theory related to weather prediction and weather forecast model design and verification. Laboratory develops computer methods to illustrate topics in lecture.

120. Atmospheric Thermodynamics and Cloud Physics (3) I. Weare
Lecture/discussion—3 hours. Prerequisite: Mathematics 21C; Physics 9A; course 60 (may be taken concurrently). Atmospheric composition and structure, thermodynamics of atmospheric gases, thermal properties of dry and moist air, atmospheric stability; cloud nucleation, cloud growth by condensation and collision, cloud models.

121A. Atmospheric Dynamics (3) II. Nathan
Lecture—3 hours. Prerequisite: course 120, Mathematics 21D, Physics 9B. The atmosphere in motion: equations of motion for rotating atmospheres; pressure and density fields and their relations to atmospheric circulations; wave motion in the atmosphere; vorticity. The physical basis of modern numerical methods in meteorology.

121B. Atmospheric Dynamics (3) III. Nathan
Lecture—3 hours. Prerequisite: course 121A. The dynamics of fluid motion in geophysical and laboratory systems: Rossby waves; Helmholtz waves; the effect of turbulence; boundary layers; the Ekman layer. The dynamics of convective motion: the Rayleigh problem; penetrative convection; convective plumes; cumulus models.

124. Meteorological Instruments and Observations (3) I. Paw U
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 60; Physics 9C. Modern meteorological instruments and their use in meteorological observations and measurements. Both standard and micrometeorological instruments are included.

128. Radiation and Satellite Meteorology (4) II. Weare
Lecture/discussion—3 hours; discussion/laboratory—1 hour. Prerequisite: course 60, Physics 9B, Mathematics 22B, 21D. Concepts of atmospheric radiation and the use of satellites in remote sensing. Emphasis on the modification of solar and infrared radiation by the atmosphere. Estimation from satellite data of atmospheric variables such as temperatures and cloudiness.

133. Biometeorology (4) II. Paw U
Lecture—3 hours; discussion—1 hour. Prerequisite: two courses in a biological discipline; Mathematics 16B. Atmospheric and biological interactions. Physical basis for plant, animal and human response and adaptation to short-term and long-term meteorological events. Students who have completed course 105 may receive only two units of credit.

*Course not offered this academic year.

149. Introduction to Air Pollution (3) I. Carroll, Chang, Raabe (Civil Engineering)
Lecture—3 hours. Prerequisite: Mathematics 22B, 21D; Chemistry 1B; course 121A or Engineering 103A. Examination of physical and technical aspects of air pollution. Emphasis on geophysical processes and air pollution meteorology as well as physical and chemical properties of pollutants. (Same course as Civil Engineering 149.)

***150. Computer Methods in Meteorology** (4) II. Grotjahn
Lecture—3 hours; laboratory/discussion—2 hours. Prerequisite: Engineering 5, Mathematics 22B, and a course in fluid dynamics (course 121A, Physics 104A or Engineering 103A), or consent of instructor. Numerical techniques and their applications to meteorological problems. Finite differencing and spectral (Fourier transform) methods. Advection equation, simple forecast models, eigenvalue matrices, time series. Students will write and run FORTRAN programs to illustrate these topics.

158. Boundary-Layer Meteorology (4) III. Paw U
Lecture—3 hours; discussion—1 hour. Prerequisite: course 121A. Growth, development and structure of the atmospheric layer directly influenced by the underlying surface and extending to a maximum of about two kilometers under convective conditions. Turbulent diffusion in the boundary layer. The microclimate at and near the ground surface.

192. Atmospheric Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Internship off and on campus in atmospheric science. Internship supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: three upper division units in Atmospheric Science. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: three upper division units in Atmospheric Science and at least an overall B average. (P/NP grading only.)

Graduate Courses

200. Atmospheric Processes (3) I. Grotjahn
Lecture—3 hours. Prerequisite: Mathematics 22B-22C; Physics 9B. Advanced phenomenological and physical study of atmospheric structure and processes including radiation, statics, thermal structure and weather phenomena. Accelerated presentation of the major topics covered in courses 60, 110A-110B, 120, and 128. Credit not allowed to students having completed any two of these courses.

221A. Advanced Atmospheric Dynamics I (3) II. Nathan
Lecture—3 hours. Prerequisite: course 121B. Shallow water theory and potential vorticity conservation. Mathematical and physical properties of geophysical waves. Wave-wave interactions. Barotropic instability of geophysical flows. Offered in alternate years.

***221B. Advanced Atmospheric Dynamics II** (3) III. Nathan
Lecture—3 hours. Prerequisite: course 221A. Quasi-geostrophic potential vorticity equation for a rotating stratified atmosphere on a sphere. Conditions for instability in stratified atmospheres; baroclinic instability. Wave-zonal flow interaction theory. Forced waves in the atmosphere. Nonlinear theory of baroclinic instability. Offered in alternate years.

***223. Advanced Boundary-Layer Meteorology** (3) III. Shaw
Lecture—3 hours. Prerequisite: course 230. Characteristics of the atmospheric boundary layer under convective and nocturnal conditions. Heat budget at the surface and boundary layer forcing. Similarity theory and scaling of the boundary layer. Measurement and simulation techniques. Offered in alternate years.

230. Atmospheric Turbulence (3) III. Shaw
Lecture—3 hours. Prerequisite: course 121B or 158. Dynamics and energetics of turbulence in the atmosphere including vorticity dynamics. Statistical descrip-

tion of turbulence; Eulerian and Lagrangian scales, spectral analysis, conditional sampling techniques. Turbulent diffusion; the closure problem, gradient-diffusion and second-order methods. Offered in alternate years.

231. Advanced Air Pollution Meteorology (3) III. Carroll
Lecture—3 hours. Prerequisite: course 149, and one course in fluid dynamics. Processes determining transport and diffusion of primary and secondary pollutants. Models of turbulence, of the atmospheric boundary layer and of mesoscale wind fields, as applicable to pollutant dispersion problems are examined. Offered in alternate years.

233. Advanced Biometeorology (3) II. Paw U
Lecture/discussion—3 hours. Prerequisite: course 133 or consent of instructor. Current topics in biometeorology. Physical and biological basis for water vapor, other gases, and energy exchange with the atmosphere. Topics include modeling and measuring turbulent transport from plant canopies, surface temperatures and energy budgets, bio-aerosol physics and aerobiology. Offered in alternate years.

***240. General Circulation of the Atmosphere** (3) II. Grotjahn
Lecture—3 hours. Prerequisite: course 121B. Large-scale, observed atmospheric circulations. Energy and momentum balances derived and compared with observations. Theoretical framework developed to synthesize observed features. Offered in alternate years.

***241. Climate Dynamics** (3) I. Weare
Lecture—3 hours. Prerequisite: courses 120, 121A, 121B or the equivalent; Applied Science Engineering 115 or the equivalent computer programming experience; course 150 recommended. Dynamics of climatic variations. Global and zonal average energy balance models. Parameterizations of radiative transfer, convection, and ocean circulation. Introduction to primitive equation climate models. Offered in alternate years.

250. Meso-Scale Meteorology (3) I. Soong
Lecture—3 hours. Prerequisite: graduate standing, course 150, a course in partial differential equations; or consent of instructor. The study of weather phenomena with horizontal spatial dimensions between 2.5 and 2500 kilometers. Methods of observational study and numerical modeling of the structure and temporal behavior of these weather systems. Offered in alternate years.

***255. Numerical Modeling of the Atmosphere** (4) III. Grotjahn and Soong
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 121B and Engineering 5; course 150 recommended. Principles of numerical modeling of the dynamic, thermodynamic and physical processes of the atmosphere. Hands-on experiments on model development using the shallow water equations and the primitive equations. Operational forecast models. Offered in alternate years.

270A-G. Topics in Atmospheric Science (1-3) I, II, III. The Staff
Discussion—1-3 hours. Applications and concepts in (A) Meteorological Statistics; (B) Computer Modeling of the Atmosphere; (C) Design of Experiments and Field Studies in Meteorology; (D) Solar and Infrared Radiation in the Atmosphere; (E) Aerosol and Cloud Physics; (F) Atmospheric Chemistry; (G) General Meteorology.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: graduate standing in Atmospheric Science or related field. Current developments in selected areas of atmospheric research. Topics will vary according to student and faculty interests. (S/U grading only.)

291A-E. Research Conference in Atmospheric Science (1-3) I, II, III. The Staff
Lecture/discussion—1-3 hours. Review and discussion of current literature in: (A) Air Quality Meteorology; (B) Biometeorology; (C) Boundary Layer Meteorology; (D) Climate Dynamics; (E) General Meteorology; May be repeated up to a total of 6 units per segment. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Atmospheric Science (A Graduate Group)

John J. Carroll, Ph.D., Chairperson of the Group
(916-752-3245)

Group Office, 151 Hoagland Hall (916-752-1406)

Faculty. Includes eighteen faculty members from the Departments of Land, Air and Water Resources, Mechanical Engineering, Civil and Environmental Engineering, Geography, Physics, the Institute of Toxicology and Environmental Health, and the Division of Environmental Studies.

Graduate Study. The Graduate Group in Atmospheric Science offers both the M.S. and Ph.D. degree programs. The student can place major emphasis on graduate work in one or more of the following fields: air quality meteorology, biometeorology, micrometeorology, numerical weather prediction, remote sensing, climate dynamics, large scale dynamics, and mesoscale meteorology. The diverse and extensive backgrounds of the faculty allow opportunities for interdisciplinary training and research.

Preparation. The Group encourages applications from all interested students with backgrounds in the physical or natural sciences. Basic qualifications for students entering the Atmospheric Science graduate program include mathematics to the level of vector calculus and differential equations, and one year of college-level physics. Considerable flexibility may be allowed for students with high academic potential, but it is expected that deficiencies in preparatory material and in key undergraduate atmospheric science courses be completed within the first year of graduate study.

Graduate Adviser. K.T. Paw U (*Land, Air and Water Resources, 752-1510*).

Graduate Admissions Officer. T.R. Nathan (*Land, Air and Water Resources, 752-1609*).

Avian Medicine

See Medicine and Epidemiology

Avian Sciences

(College of Agricultural and Environmental Sciences)

Barry W. Wilson, Ph.D., Chairperson of the Department

Department Office, 3202B Meyer Hall (916-752-1300)

Faculty

Francine A. Bradley, Ph.D., Lecturer
Ann T. Brice, Ph.D., Lecturer
Ralph A. Ernst, Ph.D., Lecturer
Annie J. King, Ph.D., Associate Professor
Kirk C. Klasing, Ph.D., Professor
James R. Millam, Ph.D., Associate Professor
Alida Morzenti, M.S., Lecturer
Kathryn Radke, Ph.D., Associate Professor
Wesley W. Weathers, Ph.D., Professor
Barry W. Wilson, Ph.D., Professor

Emeriti Faculty

Ursula K. Abbott, Ph.D., Professor Emerita
 Hans Abplanalp, Ph.D., Professor Emeritus
 C. Richard Grau, Ph.D., Professor Emeritus
 F. Howard Kratzer, Ph.D., Professor Emeritus
 Frank X. Ogasawara, Ph.D., Professor Emeritus
 Pran N. Vohra, Ph.D., Professor Emeritus
 Wilbor O. Wilson, Ph.D., Professor Emeritus

The Major Program

Avian sciences is the study of birds and the ways in which they relate to and are useful to humans. The major combines the study of avian wildlife and their environments, production and marketing of domestic birds and eggs, caged exotic bird management, and basic and applied laboratory research on birds with a broad introduction to biological science.

The Program. The flexibility of the program and the close personal interaction between students, faculty, and specialists in the field give students a large role in selecting and designing their own course work. Students may specialize in a bachelor's program that qualifies them for a particular career or they may choose a program to meet other broader intellectual and cultural interests.

Internships and Career Alternatives. Independent study, undergraduate research, and internships are features emphasized in the avian sciences program. There are birds available for laboratory or special study housed within the main building as well as at the research farm and the experimental aviary. A student in the avian sciences major has a variety of career options: health-oriented research, teaching biology, gamebird production, domestic and foreign agricultural extension and advisory services, governmental agencies, or the domestic or exotic bird industries. A recent survey has shown that the majority of avian sciences graduates enter graduate school or are employed by the domestic bird industry. The remainder of the graduates were evenly distributed in the categories of professional schools, avian biology agencies, educational fields, and individual jobs indirectly associated with birds.

B.S. Major Requirements:

(For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses where possible. Equal or more comprehensive courses are acceptable.)

UNITS

English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	50-54
Avian sciences (Avian Sciences 11 or 13).....	3-4
Biological sciences (Biological Sciences 1A, 1B, 1C)	15
Chemistry (Chemistry 2A, 2B, 2C)	15
Computer science (Agricultural Systems and Environment 21)	3
Mathematics (Mathematics 16A, 16B, 16C).....	9
Physics (Physics 1A and 1B)	6
Statistics (Statistics 13)	4
Breadth Subject Matter	24
Satisfaction of General Education requirement	24
Depth Subject Matter	55
Physiological chemistry or biochemistry (Physiological Sciences 101A-101B or Biological Sciences 102 and 103)	6
Genetics (Biological Sciences 101).....	4
Nutrition (Avian Sciences 150-150L or Nutrition 110)	5
Physiology (Physiology 110)	5
Laboratory units in above listed subjects	4
(Recommended courses include Animal Science 135, Avian Sciences 150L, Biochemistry 101L, or Neurobiology, Physiology and Behavior 101.)	
Specialized courses related to avian species.....	25

Restricted Electives	31
To supplement or expand depth subject matter courses.	
Unrestricted Electives	13-19
Total Units for the Degree	180

Major Adviser. A.J. King.

Advising Center for the major is located in 3202 Meyer Hall (916-752-1300).

Minor Program Requirements:

UNITS

Avian Sciences	18
Choose 18 units from Avian Sciences 100, 101, 102, 115, 121, 123, 149, 150, 150L, Food Science and Technology 121, Animal Science 143, Physiology 117. One lower division course (Avian Sciences 11, 11L, or 13) can be used to satisfy part of the 18-unit requirement.	

Graduate Study. Further training is available through graduate or professional programs in animal physiology, genetics, nutrition, or veterinary medicine. The M.S. degree is offered in Avian Sciences. For details see under the Graduate Group in Avian Sciences. See also the Graduate Studies section in this catalog.

Related Courses. See Agricultural Economics 130; Animal Science 143; Food Science and Technology 120, 120L, 121; International Agricultural Development 102; Molecular and Cellular Biology 150, 150L; Nutrition 123.

Courses in Avian Sciences (AVS)**Lower Division Courses**

11. Introduction to Poultry Science (3) II. Bradley
 Lecture—3 hours; one field trip required. The mosaic of events that have tied poultry science to other scientific disciplines and poultry to humans. Poultry science techniques and production methods from the time of domestication to the present. General Education credit: Nature and Environment.

11L. Laboratory in Avian Sciences (1) II. Morzenti
 Laboratory—3 hours. Prerequisite: course 11 (may be taken concurrently). Demonstrations, laboratory exercises and two Saturday field trips; management, anatomy, reproduction, egg incubation, nutrition, health and welfare of domestic birds; data collection techniques.

13. Birds, Humans and the Environment (3) III.

Wilson, Brice

Lecture—2 hours; discussion—1 hour; half-day field trip. Interrelationships of the worlds of birds and humans. Lectures, discussions, field trips and projects focus on ecology, avian evolution, physiology, reproduction, flight, behavior, folklore, identification, ecotoxicology and conservation. Current environmental issues are emphasized. General Education credit: Nature and Environment.

15L. Captive Raptor Management (2) I, II, III.

Morzenti

Laboratory—3 hours; independent study—3 hours; one field trip. Hands-on experience handling birds of prey. Students are taught all of the skills required to handle and care for raptors, including their husbandry, biology, habitat requirements, cage design, veterinary care, rehabilitation methods, research potential and long-term care requirements.

16LA-16LB-16LC. Raptor Migration and Population Fluctuations (2-2-2) I-II-III. Morzenti

Fieldwork—3 hours; discussion—1 hour; one Saturday field trip. Prerequisite: consent of instructor. Identify raptors; study effects of weather, crops, agricultural practices on fluctuations in raptor species and numbers. Familiarize with literature; design a project; survey study sites; collect, computerize, analyze data; compare with previous years. Species, observations, emphasis are different each quarter.

92. Internship in the Avian Sciences (1-12) I, II, III.

The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: sophomore standing preferred; consent of instructor. Internship on and off campus in poultry, gamebirds or exotic bird production, management and research; or in a business, industry, or agency concerned with these entities. Compliance with Internship Approval Request form essential. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III.

The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Problems in avian biology; nutrition, breeding, and physiology of poultry/wild birds and their products. (P/NP grading only.)

Upper Division Courses

***100. Principles of Avian Sciences** (5) II. King

Lecture—4 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1A. Aspects of biology (anatomy, physiology, behavior, nutrition, reproduction and genetics) that govern the life of birds. Emphasis on those features of birds, domestic, wild and experimental, which are distinctive.

***100VM. Principles of Avian Science** (3) II. King

Lecture—4 hours; laboratory—3 hours. Prerequisite: open only to students in veterinary medicine. Same material as is taught in the first six weeks of Avian Sciences 100. Offered to veterinary students as an alternative to the complete course 100.

***101. Patterns in Avian Biology** (3) I. Weathers

Lecture—3 hours. Prerequisite: Biological Sciences 1B or the equivalent. Patterns of reproduction, locomotion, foraging, growth and development, energetics, and temperature regulation exhibited by birds. Ecological and evolutionary adaptations and allometric analysis of life history traits. Offered in alternate years.

102. Fertility and Hatchability (4) I. Abbott

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100, Biological Sciences 101, Zoology 100. Normal avian embryonic development. Reproductive failures resulting from disease, nutritional or genetic causes. Use of avian embryos in biomedical research.

115. Raptor Biology (3) I. Morzenti

Lecture—3 hours; two Saturday field trips. Prerequisite: Biological Sciences 1A or the equivalent. Study of birds of prey: classification, distribution, habits and habitats, migration, unique anatomical and physiological adaptations, natural and captive breeding, health and diseases, environmental concerns, conservation, legal considerations, rehabilitation, and falconry.

***121. Avian Reproduction** (2) II. Millam

Lecture—2 hours. Prerequisite: Biological Sciences 1A, 1B. Breeding cycles and reproductive strategies, egg and sperm formation, incubation, sexual development, imprinting, hormonal control of reproductive behavior and song. Species coverage includes wild and companion birds. Course has a physiological orientation.

123. Management of Companion Birds (3) III.

Millam

Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B. Captive propagation of birds, including reproduction, genetic management, health, feeding, artificial incubation, artificial insemination, and related legal aspects, including trade and smuggling. Emphasis on parrot species and the role of captive propagation in conservation.

***130. Poultry Breeding and Genetics** (3) I.

Abplanalp

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 100. Applications of genetic principles in poultry. Action of major genes in the control of morphology, reproduction and disease resistance. Breeding plans and genetic tests for major genes as well as traits with quantitative inheritance.

***149. Egg Production Management** (2) III. Ernst

Lecture—2 hours; one Saturday field trip required. Prerequisite: course 11 or the equivalent, or consent of instructor. Management of commercial table egg flocks as related to environment, nutrition, disease control, economics, housing, equipment, egg pro-

cessing and raising replacement pullets. Offered in alternate years.

***150. Nutrition of Birds** (1) III. Klasing
Lecture—1 hour. Prerequisite: Nutrition 110 (may be taken concurrently). Principles of nutrition specific to avian species, including feedstuffs, feed additives, nutrient metabolism, energy systems, and nutritional support of egg production and growth. Use of computers for feed formulation to support production. Offered in alternate years.

150L. Nutrition of Birds Laboratory (2) III. King
Laboratory—6 hours. Prerequisite: course 150. Feeding trials to show nutrient requirements. Metabolizable energy study and proximate analysis of feed. Determination of vitamins, minerals, fatty acids and other nutrients or substances in feed with emphasis on use of laboratory equipment.

190. Seminar in Avian Sciences (1) I, II, III. King
Seminar—1 hour. Prerequisite: upper division standing in Avian Sciences and consent of instructor. May be repeated three times for credit. (P/NP grading only.)

192. Internship in Avian Sciences (1-12) I, II, III.
The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of a minimum of 84 units; consent of instructor. Internship on and off campus in poultry, gamebirds or exotic bird production, management and research; or in a business, industry, or agency concerned with these entities. Compliance with Internship Approval Request form essential. (P/NP grading only.)

195. Topics in Current Research (1-3) I, II, III. The Staff (Chairperson in charge)
Lecture/discussion—variable. Hours will depend on instructor with the number of units being commensurate with time in class. Prerequisite: consent of instructor. Discussion of topics of current interest in avian sciences. May be repeated three times for credit.

197T. Tutoring in Avian Sciences (1-3) I, II, III. The Staff (Chairperson in charge)
Hours and duties vary depending upon course being tutored. Prerequisite: Avian Sciences or related major; advanced standing; consent of instructor. Tutoring of students in lower division avian sciences courses; weekly conference with instructors in charge of course; written critiques of teaching procedures. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

220. Cellular Proliferation and Oncogenes (4) I. Radke
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 101, 102, 103, 104; Genetics Graduate Group 201C or Molecular and Cellular Biology 221D or Microbiology 200C recommended. Regulation of growth and division of animal cells. The cell cycle, oncogenes, retroviruses and growth factors will be discussed in the context of normal and cancerous growth. Critical reading and writing are emphasized.

***230. Avian Endocrinology** (2) II. Millam
Lecture—2 hours. Prerequisite: course work in endocrinology, avian biology or reproductive physiology. Examination of current issues in avian endocrinology with emphasis on endocrine aspects of reproductive physiology. Offered in alternate years.

***250. Advanced Poultry Nutrition** (3) II. Klasing
Lecture—2 hours; discussion—1 hour. Prerequisite: Nutrition 110. Metabolic basis for nutrient requirements in avian species including energy, amino acids, vitamins, and minerals. Discussions on design and analysis of nutrition trials, hormonal control of metabolism, nutritional and metabolic control of nutrient partitioning and gene expression. Offered in alternate years.

260. Topics in Avian Physiological Ecology (2) I. Weathers

Lecture—1 hour; seminar—1 hour. Prerequisite: course 100; Physiology 110 or Physiological Sciences 101A-101B; senior or graduate standing. Energy and water requirements of captive and free-living birds. Metabolic requirements for growth, maintenance, reproduction, and thermoregulation. Emphasis given to diversity of patterns found in birds and their ecological correlates. Offered in alternate years.

290. Seminar (1) I, II, III. King
Seminar—1 hour. Reports and discussions of recent advances and selected topics of current interest in avian genetics, physiology, nutrition, and poultry technology.

290C. Research Conference (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Major professors lead research discussions with their graduate students. Research papers are reviewed and project proposals presented and evaluated. Format will combine seminar and discussion. (S/U grading only.)

297T. Supervised Teaching in Avian Sciences (1-4) I, II, III. The Staff (Chairperson in charge)
Tutoring—1-4 hours. Prerequisite: graduate standing and consent of instructor. Tutoring of students in lower, upper division, and graduate courses in Avian Sciences; weekly conference with instructor in charge of course; written critiques of teaching methods in lectures and laboratories. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Avian Sciences (A Graduate Group)

J.R. Millam, Ph.D., Chairperson of the Group
Group Office, 3202 Meyer Hall (916-752-1300)

Faculty. Consists of members from several departments in the College of Agricultural and Environmental Sciences, Division of Biological Sciences, and the School of Veterinary Medicine.

Graduate Study. The Graduate Group in Avian Sciences offers the M.S. degree program to students who wish to pursue specialized advanced work on avian species. The areas of specialization that may be chosen by the student at present include: nutrition, physiology, reproduction, pathology, toxicology, food chemistry, management, ecology, genetics, comparative incubation, environmental physiology, and cellular and developmental studies using wild and domestic birds as experimental animals. Both master's degree plans, thesis or comprehensive examination, are available.

Preparation. It is expected that the student will have had undergraduate preparation in a field appropriate to the course of study selected. The student will be expected to have had courses in most of the following subjects: general biology, general and organic chemistry, biochemistry, avian biology, genetics, nutrition, physiology, and statistics.

Graduate Adviser. K.C. Klasing (*Avian Sciences*).

Biochemistry and Biophysics

See Biological Sciences: Section
of Molecular and Cellular Biology

Biochemistry and Molecular Biology (A Graduate Group)

John W. Hershey, Ph.D., Chairperson of the Group
Group Office, 188 Briggs Hall (916-752-9091)

Faculty. Consists of members from the Colleges of Letters and Science, and Agricultural and Environmental Sciences, and the Schools of Medicine and of Veterinary Medicine.

Graduate Study. The Graduate Group in Biochemistry and Molecular Biology offers programs of study and research leading to the M.S. and Ph.D. degrees. Graduate work in biochemistry involves a broad overview plus specialization in one or more of the following: protein chemistry, control of gene expression, plasmids, gene rearrangements, chromosome structure and function, immunochemistry, molecular virology, reproductive biochemistry, structure and function of surfaces, protein synthesis, biochemistry of neoplasia, biochemistry of chloroplasts, lipid biosynthesis, hormonal control of metabolism, photobiology, enzymology, and membrane transport. For detailed information regarding graduate study, address the chairperson of the group.

Graduate Advisers. E. Bandman (*Food Science and Technology*), D.J. Klionsky (*Microbiology*), J.C. Lagarias (*Molecular and Cellular Biology*), T. Wilkins (*Agronomy and Range Science*).

Courses in Biochemistry and Molecular Biology (BMB)

Graduate Courses

290. Seminar (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Biological Chemistry

See Medicine, School of

Biological and Agricultural Engineering

(College of Agricultural and Environmental Sciences)
David J. Hills, Ph.D., Chairperson of the
Department
Department Office, 2030 Bainer Hall (916-752-0102)

Faculty

William J. Chancellor, Ph.D., Professor
Pictiaw (Paul) Chen, Ph.D., Professor
Michael J. Delwiche, Ph.D., Professor
Robert B. Fridley, Ph.D., Professor
Roger E. Garrett, Ph.D., Professor
D. Ken Giles, Ph.D., Associate Professor
Mark E. Grismer, Ph.D., Associate Professor
Bruce R. Hartsough, Ph.D., Associate Professor
David J. Hills, Ph.D., Professor
Bryan M. Jenkins, Ph.D., Professor
John M. Krochta, Ph.D., Professor
Miguel A. Mariño, Ph.D., Professor
Kathryn McCarthy, Ph.D., Assistant Professor
Michael J. McCarthy, Ph.D., Associate Professor

R. Larry Merson, Ph.D., Professor
 John A. Miles, Ph.D., Professor
 Ning Pan, Ph.D., Assistant Professor
 Marc B. Parlange, Ph.D., Associate Professor
 Raul H. Piedrahita, Ph.D., Associate Professor
 Richard E. Plant, Ph.D., Professor
 James W. Rumsey, M.S., Lecturer
 Thomas R. Rumsey, Ph.D., Professor
 R. Paul Singh, Ph.D., Professor
 David C. Slaughter, Ph.D., Assistant Professor
 Henry E. Studer, M.S., Professor
 Shrinivasa K. Upadhyaya, Ph.D., Professor
 Wesley W. Wallender, Ph.D., Professor

Emeriti Faculty

Norman B. Akesson, M.S., Professor Emeritus
 John R. Goss, M.S., Professor Emeritus
 George F. Hanna, M.Ed., Lecturer Emeritus
 S. Milton Henderson, M.S., Sc.D., Professor Emeritus
 Robert A. Kepner, B.S., Professor Emeritus
 Coby Lorenzen, Jr., M.S., Professor Emeritus
 Stanton R. Morrison, Ph.D., Professor Emeritus
 Michael O'Brien, Ph.D., Professor Emeritus
 Wesley E. Yates, M.S., Professor Emeritus

Major Programs and Graduate Study. For the Bachelor of Science program see the major in Engineering; for graduate study see the Graduate Studies section in this catalog.

Courses. Courses are listed under Applied Biological Systems Technology, and Engineering: Biological and Agricultural (Biological Systems Engineering).

Minor Program. The Department of Biological and Agricultural Engineering offers a minor in Applied Biological Systems Technology. This minor is designed for non-engineering students interested in becoming familiar with engineering terminology and procedures. Coursework provides knowledge of material properties, design procedures, fabrication principles, and hardware practices.

Biological Sciences

(College of Agricultural and Environmental Sciences and College of Letters and Science)

Mark G. McNamee, Ph.D., Interim Dean of Biological Sciences

Mark F. Sanders, Ph.D., Associate Dean—
Undergraduate Academic Programs

Division Office, Administration, 355 Briggs Hall (916-752-6764)

Division Office, Undergraduate Academic Programs, 66 Briggs Hall (916-752-0410)

The Division of Biological Sciences is an intercollege unit that coordinates campus-wide programs in basic biology and administers undergraduate programs in the core disciplines of biology on behalf of the College of Agricultural and Environmental Sciences and the College of Letters and Science. The division is organized into five sections that represent the major themes of modern biology: Evolution and Ecology; Microbiology; Neurobiology, Physiology, and Behavior; Molecular and Cellular Biology; and Plant Biology. For some of its programs (e.g., core courses, the division-wide Biological Sciences major), the division functions as a single academic department; other programs (e.g., courses and majors in the various core disciplines of biology, research) are the responsibility of individual sections of the division.

The present organizational structure of the division was established on July 1, 1993, replacing the six departments that previously comprised the division: Animal Physiology, Biochemistry and Biophysics, Botany, Genetics, Microbiology, and Zoology. The revision of the curriculum that accompanies this reorganization will occur over several years. A number of the previous majors will continue, and new courses and majors will be added. Most courses have been renumbered or relocated in new sections to reflect the

new organizational structure; these changes are listed in a concordance table at the back of this catalog. Students who elect a given major are entitled to complete that major according to the degree requirements listed in the catalog at the time the major is declared.

Faculty

All faculty are primary members of one section and some faculty are secondary members of a second section as well. See "Sections of the Division" below for a list of faculty in each section.

Programs of Study

Seven majors are offered leading to a B.S. degree in:

Biochemistry
Biological Sciences
Genetics
Evolution and Ecology (Zoology)
Microbiology
Physiology
Plant Biology (Botany)

Four majors leading to an A.B. degree are offered in:

Biological Sciences
Evolution and Ecology (Zoology)
Microbiology
Plant Biology (Botany)

Choice of College. The Bachelor of Arts degree is offered only by the College of Letters and Science. The Bachelor of Science degree is offered by both the College of Letters and Science and the College of Agricultural and Environmental Sciences. The major requirements are the same in each college, but there are differences in the college requirements and policies. See the appropriate college sections in the front of this catalog for more information.

Courses. See "Division-wide Programs and Courses" (following "The Major Programs") for descriptions of Biological Sciences courses offered jointly by the sections of the division. See "Sections of the Division" below for descriptions of courses offered by the individual sections.

Note: Most courses have been renumbered or relocated to new sections as a result of the reorganization. A concordance table identifying the previous course number and the new course number or section location appears at the back of this catalog following the last department/course descriptions.

Student Services. Student affairs officers at the division's Undergraduate Academic Programs Office, 66 Briggs Hall, and advising staff in section offices provide information and counseling on the major programs and courses offered by the sections of the division.

The Major Programs

The division offers two categories of majors. One is the Biological Sciences major, which is offered by the entire division. This major is broad in concept, designed to span the numerous core disciplines of biology. The Biological Sciences major covers most dimensions of the study of life, ranging from the molecular to the population level. While emphasizing breadth, the Biological Sciences major also features an area of emphasis requirement which provides concentrated attention to one facet of biology at the upper division level. Each area of emphasis coincides with one of the sections of the division. More specialized majors that focus on one of the core disciplines are offered through individual sections of the division and listed under "Majors in the Core Disciplines of Biology."

Division-wide Biological Sciences Major

(Sections of Evolution and Ecology; Microbiology; Molecular and Cellular Biology; Neurobiology, Physiology, and Behavior; and Plant Biology)

The Program. Students select either a Bachelor of Arts or Bachelor of Science program in Biological Sciences. The Bachelor of Science programs include mathematics, general and organic chemistry, and courses in biology that emphasize breadth as well as

depth. This program can be used to satisfy requirements for admission to graduate schools, leading either to a variety of professional health careers, or further study in basic and applied areas of biology. The Bachelor of Arts program emphasizes organisms, evolution and ecology. This degree program prepares students for a variety of careers and professional/graduate programs. It is appropriate for students interested in teaching biology at the secondary school level, and for students interested in careers that bear on the ecological problems that require the development of public policy.

Career Alternatives. The biological sciences degree provides suitable preparation for a wide variety of careers, including teaching, biological research, work with various governmental agencies or with private companies, and all the health sciences. It is an excellent background for students wishing to enter a graduate program in biology, a teacher-training program, a health professional school, or other professional schools.

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	60-67
Math 16A-16B-16C	9
Chemistry 2A-2B-2C	15
Chemistry 8A-8B or 118A-118B-118C	6-12
Biological Sciences 1A-1B-1C	15
Statistics 13, 32, 100, or 102	3-4
Physics 5A-5B-5C	12
Depth Subject Matter	45 units
Biological Sciences 101, 102, 103, 104	13
Restricted Electives	32

Breadth in the major is obtained by a requirement for at least one course from each of the five field requirement lists, (a) through (e), below. See your area of emphasis for any specific course requirements.

Depth in the major comes through completion of one area of emphasis listed below, and additional upper division biology courses, as needed, to total to 32 units. See your faculty adviser regarding the choice of those courses.

Depth in the major must include at least 2 units (or 6 hours per week) of laboratory.

See your area of emphasis for any specific course requirements.

Note: Although courses may be listed in more than one category, each course may be offered in satisfaction of only one requirement.

Field Requirement Course List

- (a) *Evolution:* Anthropology 151, 154A; Evolution and Ecology 100; Geology 107; Plant Science 103
- (b) *Ecology:* Anthropology 154B; Biological Sciences 122; Entomology 104, 156; Environmental Studies 100, 121; Evolution and Ecology 101; Geology 145; Microbiology 120; Wildlife and Fisheries Biology 151
- (c) *Microbiology:* Food Science 104; Microbiology 102, 130A, 162; Soil Science 111; Veterinary Microbiology and Immunology 127, 128
- (d) *Neurobiology, physiology and behavior:* Anthropology 154A, 154B; Entomology 102, 104; Environmental Studies 125; Neurobiology, Physiology and Behavior 101, 102, 141, 160
- (e) *Plant biology:* Agronomy 120; Environmental Horticulture 105; Evolution and Ecology 121, 140; Plant Biology 102, 105, 108, 111, 112, 116, 117, 118, 119, 120, 121; Plant Pathology 120, 130; Plant Science 103; Range Science 100

Areas of Emphasis:

Evolution and Ecology emphasis.....13-18

- (1) *Field requirement:* Student must take Evolution and Ecology 100 to satisfy Field requirement (a), and Evolution and Ecology 101 to satisfy Field requirement (b).

- (2) Evolution and Ecology 1024
 (3) *Biodiversity*: Six or more units, to include at least two units (or 6 hours per week) of lab, from the following: Entomology 100, 100L, 107, 109; Evolution and Ecology 112, 112L, 121, 134, 134L, 136, 136L, 137, 137L; Geology 107, 107L, 145, 146; Microbiology 105; Nematology 110; Plant Biology 102, 108, 118, 119; Wildlife and Fisheries Biology 110, 110L, 111, 111L, 120, 120L6-9
 (4) *Restricted electives*: One from the following: Entomology 103, 104, 156, 156L; Environmental Studies 121, 123, 125, 150A, 150B, 150C, 151, 151L; Evolution and Ecology 105, 117, 138, 140, 141, 144, 147, 149, 170, 170L; Geology 107, 107L, 145, 146; Nematology 100; Neurobiology, Physiology and Behavior 102; Philosophy 108; Plant Biology 116, 121; Wildlife and Fisheries Biology 1363-5

Microbiology emphasis (four options, a through d, below)11-13

(1) *Field requirement*: Students must take Microbiology 102 to satisfy Field requirement (c).

(2) *Laboratory requirement*: Students must take Microbiology 102L to satisfy the restricted elective lab requirement.

(3) *Options*: Complete one of the four clusters (options a-d) below; or Complete an individual cluster with approval from your faculty adviser.

(a) Microbial Physiology and Molecular Genetics option (in the Microbiology emphasis)12

- Microbiology 130A3
 Microbiology 130B3
 Select six or more units from the following courses: Microbiology 130L, 177; Molecular and Cellular Biology 121, 123, 141, 1616

(b) Microbial Diversity and Ecology option (in the Microbiology emphasis)12

- Microbiology 1055
 Microbiology 1624
 Select three or more units from the following: Geology 111B; Microbiology 120, 120L; Plant Biology 118; Soil Science 1113

(c) Biotechnology and Applied Microbiology option (in the Microbiology emphasis)12-13

- Microbiology 130A3
 Select one course from: Food Science and Technology 102A, 104, or Viticulture and Enology 1863-4
 Select six or more units from the following: Chemical Engineering 161A; Microbiology 110, 130L; Molecular and Cellular Biology 121, 122, 123, 170L6

(d) Medical Microbiology option (in the Microbiology emphasis)11-13

- Veterinary Microbiology and Immunology 127 or 1325
 Microbiology 162 or Veterinary Microbiology and Immunology 1283-4
 Medical Microbiology 107 or Veterinary Microbiology and Immunology 1263-4

Molecular and Cellular Biology emphasis13-18

- (1) *Molecular biology and gene expression*: One course from Molecular and Cellular Biology 121, 141, 1613-4
 (2) *Laboratory experience*: One or more laboratory courses from Molecular and Cellular Biology 120L, 140L, 160L or other laboratory course that emphasizes cellular or molecular biology with approval from your adviser3-6
 (3) *Restricted electives*: Additional units from Biological Sciences 120; Molecular and Cellular Biology 122, 123, 126, 141, 142, 150, 151, 162, 163; Medical Microbiology

107; Neurobiology, Physiology and Behavior 103; Plant Biology 125; Veterinary Microbiology and Immunology 126 or other courses with adviser's approval7-8

Neurobiology, Physiology and Behavior emphasis15

Select courses from at least two of the following areas and include one lab15

- (1) *Neurobiology*: Neurobiology, Physiology and Behavior 106, 112, 125, 126, 160, 160L; Psychology 108.
 (2) *Physiology*: Biological Sciences 104; Entomology 102; Evolution and Ecology 170, 170L; Neurobiology, Physiology and Behavior 101, 101L, 103, 104L, 106, 111A, 111B, 111C, 113, 114, 117, 119, 119L, 121, 121L, 127, 128, 130, 140, 141; Medical Microbiology 107; Physical Education 101, 101L, 102, 110, 111; Veterinary Microbiology and Immunology 126; Wildlife and Fisheries Biology 121.
 (3) *Behavior*: Anthropology 154A, 154B; Entomology 104; Environmental Studies 125; Neurobiology, Physiology and Behavior 102.

Plant Biology emphasis13-16

Select one course from each of the following four areas:

- (1) *Anatomy and morphology*: Evolution and Ecology 140; Plant Biology 105, 116, 1184-5
 (2) *Physiology and development*: Plant Biology 111, 112, 125; Plant Pathology 1303
 (3) *Evolution and ecology*: Evolution and Ecology 100; Plant Biology 117; Plant Science 1033-4
 (4) *Applied plant biology*: Agronomy 100; Plant Science 109, 112, 113, 1403-4

Total Units for the Major105-112

A.B. Major Requirements:

UNITS

Preparatory Subject Matter40-53

- Biological Sciences 1A-1B-1C15
 Chemistry 2A-2B10
 Chemistry 8A-8B or 118A-118B-118C6-12
 Physics 1A-1B or 5A-5B-5C6-12
 Statistics 13, 32, 100, or 1023-4
 Recommended: Chemistry 2C and Mathematics 16A-16B.

Depth Subject Matter38-47

- Biological Sciences 101 and 1027
 One course in evolution from Evolution and Ecology 100, 140; Geology 107, 144; Plant Biology 1164
 One course in ecology from Environmental Studies 100; Evolution and Ecology 101; Evolution and Ecology 117/Plant Biology 117; Plant Biology 1013-4
 One course in philosophy of science from History and Philosophy of Science 130A, 130B; Philosophy 1084
 One course in physiology from Environmental Horticulture 102; Entomology 101, 102; Neurobiology, Physiology and Behavior 101; Plant Biology 111, 1123-5
 One course each in animal, microbial and plant diversity (see "Diversity List" below)9-15

Additional upper division coursework in biological sciences to achieve a total of 38 or more units (see "Approved Biology Electives" list below).

Upper division coursework must include at least 2 units (6 hours per week) of laboratory and/or fieldwork.

Note: Although courses may be listed in more than one category, each course may be offered in satisfaction of only one requirement.

Total units for the major78-100

Diversity Lists

(a) *Animal diversity*: Avian Sciences 101; Entomology 100, 107, 109; Evolution and Ecology 105, 112, 133, 134, 136, 137; Nematology 110; Wildlife and Fisheries Biology 110, 111, 120.

(b) *Microbial diversity*: Microbiology 105, 162; Plant Biology 118, 119; Soil Science 111; Veterinary Microbiology and Immunology 127, 128, 132.

(c) *Plant diversity*: Evolution and Ecology 121, 140; Plant Biology 102, 108, 116, 121.

Approved Biology Electives

- Anatomy 100
 Anthropology 151, 152, 153, 154A, 154B, 155, 156, 157
 Avian Sciences 100, 102, 130, 150
 Biological Sciences—All upper division courses
 Cell Biology and Human Anatomy 101, 101L
 Chemistry 107A, 107B, 108, 150
 Clinical Pathology 101, 101L, 102
 Entomology—All upper division courses
 Environmental Horticulture 105, 107
 Environmental Studies 100, 110, 121, 123, 124, 125, 129, 129L, 150C, 151, 151L
 Evolution and Ecology—All upper division courses
 Geology 106, 107, 107L, 111A, 111B, 145, 146, 150C
 Medical Microbiology 107, 115
 Microbiology—All upper division courses
 Molecular and Cellular Biology—All upper division courses
 Nematology 100, 110
 Neurobiology, Physiology and Behavior—All upper division courses
 Nutrition 101, 110, 111
 Philosophy 108
 Physical Education 101, 102, 110, 111, 113
 Plant Biology—All upper division courses
 Plant Pathology 120, 130
 Plant Science 101, 102, 103, 109
 Psychology 108, 150
 Range Science 100, 133, 135
 Vegetable Crops 105, 150
 Veterinary Microbiology and Immunology 126, 126L, 127, 128, 132
 Wildlife and Fisheries Biology 110, 111, 120, 120L, 121, 122, 130, 136, 140, 151

Other Upper Division Courses

There is a limitation on variable-unit courses that may be counted toward the major. Of these courses, up to 4 units of 199 courses may be counted, and no units of 192 or 197T courses may be counted.

Honors and Honors Programs. Students who have met the minimum grade-point average and the units-completed criteria, and who have obtained a sponsoring faculty supervisor may elect to participate in the Biological Sciences Honors Program. The program entails completion of a research project and honors thesis through enrollment in course 194H. Complete details *must* be obtained from the Undergraduate Academic Programs Office, 66 Briggs Hall, before starting in the Honors Program.

The Division of Biological Sciences also confers Citations for Outstanding Performance on undergraduates majoring in Biological Sciences who have demonstrated superior academic performance and individual achievement in research. Students who wish to be considered for a citation must first meet or exceed a specified grade-point average and participate in an appropriate research project.

The division additionally recommends students in the Biological Sciences major to the College of Letters and Science for the purpose of awarding High and Highest Honors at graduation. For further details on the above programs and awards, contact the Undergraduate Academic Programs Office, 66 Briggs Hall.

The Minor Program

The minor in Biological Sciences is designed to acquaint students with the range and variety of modern biology, including work in two or three areas: animal biology, plant biology, and microbiology; and in four of the following five subdisciplines: organismal

biology, ecology, evolution, physiology, and biochemistry and cell biology. The list of required courses is restricted to those that are acceptable for the major program in Biological Sciences but which do not require extensive upper division preparatory work; substitutions of more advanced courses can be made, as appropriate, with the approval of an adviser for the minor.

Information on certification of completion of the minor program can be obtained from the division's Undergraduate Academic Programs Office, 66 Briggs Hall.

Minor Program Requirements:

	UNITS
Biological Sciences	24
Biological Sciences 1C	5
Biological Sciences 101.....	4
Additional upper division units (as specified in the area requirements and group requirements below).....	15

Area Requirement: one course in two of the area requirements below: animal biology, microbiology, and plant biology.

(a) *Animal biology:* Anatomy 100; Anthropology 151, 152, 153, 154A, 155, 156; Avian Sciences 100; Biological Sciences 120, 122; Cell Biology and Human Anatomy 101; Entomology 101, 102, 103, 104, 109, 116, 119, 153; Environmental Studies 129; Evolution and Ecology 100, 101, 105, 112, 133, 134, 136, 137, 138, 147, 149, 170; Geology 111A; Molecular and Cellular Biology 150; Nematology 110; Neurobiology, Physiology and Behavior 102; Wildlife and Fisheries Biology 110, 111, 120, 140, 151.

(b) *Microbiology:* Entomology 156; Geology 111B; Medical Microbiology 107; all upper division Microbiology courses (excluding 190-199); Plant Biology 118, 119; Plant Pathology 120, 130; Veterinary Microbiology and Immunology 126, 127, 128, 132.

(c) *Plant biology:* Environmental Horticulture 105, 107; Evolution and Ecology 121, 140, 144; All upper division Plant Biology courses, excluding 190-199 and Botany/Zoology 130; Plant Science 101, 103; Range Science 100; Vegetable Crops 105.

Note: Plant Biology 118 or 119 may be used for either microbiology or plant biology (not both).

Group Requirement: at least one course or course sequence from four of the five group requirements below:

(a) *Organismal biology:* Evolution and Ecology 112, 136, 137; Microbiology 105; Molecular and Cellular Biology 150; Plant Biology 102, 105.

(b) *Population biology and ecology:* Anthropology 154A; Environmental Studies 100; Evolution and Ecology 101, 121; Wildlife and Fisheries Biology 151.

(c) *Evolutionary biology:* Anthropology 151; Evolution and Ecology 100, 140, 149; Geology 107; Plant Biology 116.

(d) *Physiology:* Neurobiology, Physiology and Behavior 101; Plant Biology 111, 112.

(e) *Biochemistry and cell biology:* Biological Sciences 102 and 103, 104; Molecular and Cellular Biology 141.

Note: A course that appears on both the area and group requirement lists may be used toward satisfying both requirements. Both halves of sequential courses connected by a hyphen must be taken.

Advisers and Advising: Information on the Biological Sciences major or minor can be obtained from the Undergraduate Academic Programs Office, 66 Briggs Hall.

Teaching Credential Subject Representative. Associate Dean (Biological Sciences). See also the Teacher Education Program.

Majors in the Core Disciplines of Biology

The Biochemistry Major Program

(Section of Molecular and Cellular Biology)

The biochemistry major introduces students to the chemistry of living organisms and the experimental techniques that are used to probe the structures and functions of biologically important molecules. Students who enjoy both chemistry and biology and who are comfortable with quantitative approaches to problem solving will find biochemistry a rewarding field of study.

The Program. The biochemistry program begins with the four course upper division common curriculum that provides an introduction to the principles of biochemistry, genetics, and cell biology. Biochemistry majors then take a comprehensive and rigorous laboratory course designed to familiarize them with the most important aspects of biochemical research. Additional upper division courses in biochemistry examine detailed aspects of modern biochemistry. Students also are required to take courses in other biological sciences and a full year of physical chemistry.

Career Alternatives. The biochemistry program provides a solid scientific background for students seeking a research, teaching, or service career in the life sciences. Positions are open to biochemists in biomedical, biotechnology, pharmaceutical, agricultural research and chemical industries. Also, university-affiliated research laboratories, hospital laboratories, and government-sponsored research facilities provide employment opportunities. The major provides excellent preparation for advanced study in graduate or professional schools.

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	54-58
Biological Sciences 1A-1B-1C	15
Chemistry 2A-2B-2C.....	15
Mathematics 16A-16B-16C or 21A-21B-21C	9-12
Physics 5A-5B-5C	12
Statistics 13, 32, 100 or 102.....	3-4
Depth Subject Matter	54-55
Biological Sciences 101, 102, 103, 104.....	13
Chemistry 118A-118B-118C or 128A-128B-128C, 129A-129B	12-13
Chemistry 107A-107B-108	9
Molecular and Cellular Biology 120L, 121, 122, 123, 138	16
Restricted Electives.....	4
Upper division courses in biological sciences or chemistry. Students are encouraged to obtain additional laboratory experience, including 199 research; however, no more than 3 units of 199 may be counted toward Restricted Elective units.	

Total Units for the Major.....**108-113**

Master Adviser. L.R. Sprechman (*Section of Molecular and Cellular Biology*), 126 Briggs Hall.

Advising Center for the major is located in 156 Briggs (916-752-9032).

Graduate Study. See Biochemistry and Molecular Biology (A Graduate Group); and the Graduate Studies section in this catalog.

The Genetics Major Program

(Section of Molecular and Cellular Biology)

The genetics major is designed to provide a broad background in the biological, mathematical, and physical sciences basic to the study of heredity and evolution. The major is sufficiently flexible to accommodate students interested in the subject either as a basic discipline in the biological sciences or in terms of its applied aspects such as biotechnology, medicine, and agriculture.

The Program. The genetics program begins with the four course upper division common curriculum that provides an introduction to the principles of genetics, biochemistry, and cell biology. Genetics majors then take additional upper division courses in specialized areas of modern genetics including gene expression, evolution, development, and human genetics, as well as a laboratory course in the principles of genetics. Additional upper division courses in biological sciences are required, including a second laboratory course and participation in a seminar course in molecular genetics.

Career Alternatives. The genetics degree provides suitable preparation for a wide variety of careers, including teaching, research, work with biotechnology companies, medicine, and all the health sciences. It is also an excellent background for students wishing to enter a graduate program, a teacher-training program, medical school, veterinary school, or other professional schools.

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	60-70
Biological Sciences 1A-1B-1C	15
Chemistry 2A-2B-2C.....	15
Chemistry 8A-8B or 118A-118B-118C.....	6-12
Mathematics 16A-16B-16C or 21A-21B-21C	9-12
Physics 5A-5B-5C	12
Statistics 13, 32, 100, or 102.....	3-4
Depth Subject Matter	50-51
Biological Sciences 101, 102, 103, 104.....	13
Molecular and Cellular Biology 160L, 162, 163, 178	11
Evolution and Ecology 100.....	4
One course from the following: Molecular and Cellular Biology 121, 141, 161	3-4
One course from the following: , Microbiology 102-102L; Molecular and Cellular Biology 120L, 170L	6
Restricted Electives.....	13
Upper division courses in genetics or other fields relevant to the student's interest chosen in consultation with the adviser. No more than 4 units of 192, 198, or 199 can be used for credit in this category.	

Total Units for the Major.....**110-121**

Master Adviser. Contact R.S. Hawley (Molecular and Cellular Biology), 345 Briggs Hall.

Advising Center for the major is located in 156 Briggs Hall (916-752-0202).

Graduate Study. The Graduate Group in Genetics offers study and research leading to the M.S. and Ph.D. degrees in Genetics.

Related Courses. See Agronomy 207, 221, 222, 223, 224, 225, Animal Genetics 107, 108, 109, 204, 206, 207, 208, Anthropology 151, 152, 153, 157, 157L, Biological Chemistry 217, Evolution and Ecology 100, 149, Genetics Graduate Group courses, Molecular and Cellular Biology 121, 221C, Plant Pathology 215, Plant Science 103, 113, 122, Psychology 251, Vegetable Crops 220, 220L, 221, 221L.

The Microbiology Major Program

(Section of Microbiology)

Microbiology is the branch of biology that deals with bacteria, yeasts and other fungi, algae, protozoa, and viruses. These microorganisms are ubiquitous in nature and play a crucial role in areas such as agriculture, biotechnology, ecology, medicine, and veterinary science. The field of microbiology contributes to areas of fundamental inquiry such as biochemistry, cell biology, evolution, genetics, molecular biology, pathogenesis, and physiology. The ease and power of simultaneous genetic and biochemical analysis of microbes led to the emergence of the new disciplines of molecular biology and molecular genetics, and spawned the new industry of biotechnology.

*Course not offered this academic year.

The Program. Both undergraduate major programs provide a balance of studies in microbiology, with appropriate courses in mathematics and physical sciences. The A.B. degree program emphasizes the biology of bacteria, while the B.S. degree program includes more biochemistry and related course work. Either program, with judicious course selection, is appropriate for students contemplating a career in medicine or various allied health professions including medical technology, or teaching. The B.S. program is especially well suited for students who want a professional career in microbiology, or who wish to pursue graduate education in a biological science discipline. The choice of a major program and its suitability for particular career options should be discussed with a major adviser.

Career Alternatives. A bachelor's degree in microbiology is excellent preparation for a career in biotechnology, pharmacology, agriculture, and the food industry. It also provides a strong background for students wishing to continue on to professional studies in medicine and the other health sciences.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	47-61
Biological Sciences 1A-1B-1C	15
Chemistry 2A-2B	10
Chemistry 8A-8B or 118A-118B-118C	6-12
Mathematics 16A-16B or 21A-21B	6-8
Physics 1A-1B or 5A-5B-5C	6-12
Statistics 13	4
Depth Subject Matter	39-40
Biological Sciences 102, 103	6
Microbiology 102, 102L, 105, 130A	14
Microbiology 162 or Veterinary Microbiology and Immunology 128	3-4
Two of the following: Microbiology 120-120L, 130B-130L, 177-177L	10-11
Additional units from Microbiology 110, 120, 120L, 130B, 130L, 177, 177L; Molecular and Cellular Biology 120L; Plant Biology 114, 118, 119; Veterinary Microbiology and Immunology 126, 127	5
Total Units for the Major	85-101

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	60-67
Biological Sciences 1A-1B-1C	15
Chemistry 2A-2B-2C	15
Chemistry 8A-8B or 118A-118B-118C	6-12
Mathematics 16A-16B-16C	9
Physics 5A-5B-5C	12
Statistics 13, 32, 100 or 102	3-4
Depth Subject Matter	45-52
Biological Sciences 101, 102, 103, 104	13
Molecular and Cellular Biology 120L	6
Microbiology 102, 102L, 105, 130A, 130B	17
Microbiology 162 or Veterinary Microbiology and Immunology 128	3-4
One of the following: Food Science and Technology 104-104L; Microbiology 120-120L, 130L, 177-177L; Molecular and Cellular Biology 161-170L; Soil Science 111; Veterinary Microbiology and Immunology 127	3-9
Three additional units from Food Science and Technology 104, 104L; Medical Microbiology 107; Microbiology 110, 120, 120L, 130L, 177, 177L, 199; Molecular and Cellular Biology 161, 170L; Plant Biology 118, 119; Soil Science 111; Veterinary Microbiology and Immunology 126, 127, 132 ...	3
Total Units for the Major	105-119

Master Adviser. M. L. Wheelis (*Section of Microbiology*), 2202 Storer Hall.

Honors and Honors Program. M. L. Wheelis.

Teaching Credential Subject Representative. M. L. Wheelis. See also the Teacher Education Program.

Graduate Study. The Graduate Group in Microbiology offers programs of study and research leading to the M.S. and Ph.D. degrees in microbiology. The offerings of the Section of Microbiology are augmented by courses and faculty of the Departments and Sections of Evolution and Ecology; Food Science and Technology; Land, Air, and Water Resources; Molecular and Cellular Biology; Plant Pathology; Plant Biology; Viticulture and Enology; and the Schools of Medicine and of Veterinary Medicine. For detailed information regarding graduate study in microbiology, address the Chairperson, Graduate Group in Microbiology, Section of Microbiology.

Related Courses. For other courses related to Microbiology, see course offerings in the Division of Biological Sciences and departments of Medicine and Epidemiology; Food Science and Technology; Land, Air and Water Resources; Medical Microbiology; Plant Pathology; Plant Science; and Pathology, Microbiology and Immunology.

Faculty of the Section of Microbiology also teach or participate in the following courses: Biological Sciences 1A, 10, and 19.

The Physiology Major Program

(Section of Neurobiology, Physiology, and Behavior)

The study of physiology is concerned with understanding the mechanisms that control and carry out the vital functions of living organisms. From the single cell and its parts, through the various organ systems, to the whole animal and its relationship to its environment—the entire range of function of living matter is investigated.

The Program. An understanding of physiology must be built on a broad scientific background. In the freshman and sophomore years, physiology majors take courses in chemistry, biology, physics, and mathematics. As juniors or seniors, majors can enroll in a variety of physiology courses along with upper division courses in related sciences. With this background, students can participate in a number of advanced laboratory courses or may design an individual, independent project guided by a member of the faculty.

Career Alternatives. Completion of the physiology major provides the foundations for a challenging career in physiology and also serves as a basis for further training in schools of human and veterinary medicine, medical technology, pharmacy, dentistry, optometry, and other health sciences. Students interested in research and advanced teaching may use the program as preparation for continued study leading to advanced degrees.

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	60-70
Biological Sciences 1A-1B-1C	15
Chemistry 2A-2B-2C	15
Chemistry 8A-8B or 118A-118B-118C	6-12
Mathematics 16A-16B-16C or 21A-21B-21C	9-12
Physics 5A-5B-5C	12
Statistics 13, 32, 100 (recommended), or 102	3-4
Depth Subject Matter	47-48
Biological Sciences 101, 102, 103, 104	13
Neurobiology, Physiology and Behavior 101, 101L, 102, 103, 104L	16
Select three or more units of laboratory course work from the following list	3
Neurobiology, Physiology and Behavior 106, 111A, 111B, 111C, 160L, 194H; Physical Education 101L; 199 courses or other courses with the approval of the master adviser.	
Additional physiology depth unit requirement	12
All other Neurobiology, Physiology and Behavior courses not used in satisfaction of any other requirement; Anthropology 154A, 154B; Entomology 104; Environ-	

mental Studies 125; Physical Education 101, 102, 111.

One course from Anthropology 151, Evolution and Ecology 100, Geology 107

Total Units for Major

Master Adviser. J. Goldberg (*Section of Neurobiology, Physiology, and Behavior*), 191 Briggs Hall.

Advising Center. 196 Briggs Hall (916-752-9696)

Graduate Study. The Graduate Group in Physiology offers programs of study and research leading to the M.S. and Ph.D. degrees. Information on graduate study may be obtained by writing the Graduate Adviser, Graduate Group Complex. See also the graduate course offerings in Physiology Graduate Group and Neuroscience Graduate Group. See also the Graduate Studies section in this catalog.

The Plant Biology Major Program

Plant biology is the study of plants as organisms. It includes disciplines of cellular and molecular plant biology and the traditional areas of botany, such as anatomy, morphology, systematics, physiology, mycology, phycology, ecology, and evolution, along with the newer disciplines of cellular and molecular plant biology.

The Program. The plant biology major consists of core courses in applied plant biology, plant anatomy, plant physiology, and plant ecology, as well as biochemistry, cell biology, and genetics. In addition, students complete a set of courses in one of the following areas: 1) applied plant biology, 2) plant evolution and ecology, 3) general plant biology, and 4) plant physiology, development, and molecular biology. The major provides breadth in diverse areas of plant biology and depth in one of several areas of specialization. Independent research opportunities in plant biology are available. Consult with an adviser.

Career Alternatives. A Plant Biology degree is an excellent credential for a wide range of career options, including domestic and international opportunities in business, research and teaching in both governmental and private sectors. Plant biologists can work in the field, in the forest, in the laboratory, in botanical gardens or nurseries, in food or seed companies, or in pharmaceutical, energy or chemical industries, and pursue rewarding careers in the areas of biotechnology, environmental protection, or agribusiness. The program is also an excellent background for students wishing to enter graduate or other professional schools, including medicine, law or journalism.

Plant Biology (Botany)

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	35
Biological Sciences 1A-1B-1C	15
Chemistry 2A-2B, 8A-8B	16
Agricultural Systems and Environment 120 or Statistics 13 or 100 or 102	4
Depth Subject Matter	41-42
Biological Sciences 101	4
Plant Biology 102 or 108	5
Evolution and Ecology 140 or Plant Biology 116	14
Plant Biology 105, 111, 112, 117	15
Additional upper division units in Plant Biology or related natural science courses ...	13-14
Total Units for the Major	76-77

Recommended

Chemistry 2C; Evolution and Ecology 100; Plant Biology 118, 119.

For students with interests in specialized areas of plant biology (e.g., agricultural botany, ecology, systematics and evolution, morphology, plant physiology, etc.), certain substitutions, including courses in other sections or departments, may be allowed on *prior* consultation with a Plant Biology major adviser.

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	60-61
Biological Sciences 1A-1B-1C	15
Chemistry 2A-2B-2C	15
Chemistry 8A-8B	6
Mathematics 16A-16B-16C	9
Physics 5A-5B-5C	12
Agricultural Systems and Environment 120 or Statistics 13, 32, 100, or 102	3-4
Depth Subject Matter	45
Biological Sciences 101 or Plant Science 105 (Students completing the Applied Plant Biology option should take Plant Science 105)	4
Biological Sciences 102, 103, 104	9
Plant Biology 105, 111	8
Completion of one Option listed below	24
Applied Plant Biology option	
Plant Biology 112	3
Plant Science 101 or 103	3-4
Plant Science 140, 145	8
Molecular and Cellular Biology 120L; Plant Biology 111L; Plant Science 107L, 112L, 140L; or Vegetable Crops 191L	3-6
Additional upper division coursework from the Applied Plant Biology course list to achieve a total of 24 or more units	3-7
Plant Evolution and Ecology option	
Evolution and Ecology 100	4
Plant Biology 117 or Plant Science 101	4
One course from the Applied Plant Biol- ogy course list (Plant Science 145 recom- mended)	3-5
Additional upper division coursework from the Ecology and/or Evolution and Diversity course list to achieve a total of 24 or more units	11-13
General Plant Biology option	
Evolution and Ecology 100, Plant Biology 112	7
Plant Biology 117 or Plant Science 101	4
One course from the Applied Plant Biol- ogy course list (Plant Science 145 recom- mended)	3-5
One course from the Evolution and Diver- sity course list	3-5
Additional upper division coursework from any of the four course lists, chosen in consultation with an adviser, to achieve a total of 24 or more units	3-7
Plant Physiology, Development and Molec- ular Biology option	
Plant Biology 112	3
Molecular and Cellular Biology 120L, 170L; Plant Biology 111L or Plant Sci- ence 107L	3-4
One course from the Applied Plant Biol- ogy course list (Plant Science 145 recom- mended)	3-5
One course from the Ecology course list	3-4
One course from the Evolution and Diver- sity course list	3-5
Additional upper division coursework from the Plant Physiology, Development, and Molecular Biology course list to achieve a total of 24 or more units	3-9

Option Course Lists

Applied Plant Biology option:
Agricultural Systems and Environment 100, 107, 110, 110L, 111, 112, 113, 118, 150, 170A, 170B, 195; Atmospheric Science 133; Entomology 100, 100L, 110, 115, 119, 119L, 135; Environmental Horticulture

102, 105, 107, 120, 125, 130, 133; Environmental Tox-
icology 101; Hydrologic Science 124; International
Agricultural Development 101; Nematology 100, 110;
Plant Biology 120, 121, 122, 150; Plant Pathology 120,
125, 130; Plant Science 101, 103, 104, 105, 107, 109,
110, 112, 112L, 113, 114, 115, 116, 122, 126, 135,
140, 145, 191, 191L, 196; Pomology 103; Range Sci-
ence 100, 105, 133, 134; Soil Science 100, 105, 109,
111; Viticulture and Enology 101A, 101B, 101C, 110,
115, 116, 118.

Ecology option:

Agronomy 112; Entomology 120; Environmental and
Resource Sciences 100; Environmental Studies 100,
121, 122, 123, 124, 128, 128L, 150C, 151, 151L; Evo-
lution and Ecology 121, 138; Plant Biology 117; Plant
Science 101; Range Science 133, 134; Water Science
100, 104, 122, 122L.

Evolution and Diversity option:

Evolution and Ecology 100, 102, 140, 144, 149; Plant
Biology 102, 108, 116, 118, 119; Plant Science 103;
Vegetable Crops 105.

**Plant Physiology, Development, and Molecular
Biology** option:

Agronomy 120; Environmental Horticulture 133; Mol-
ecular and Cellular Biology 126; Plant Biology 125,
135; Plant Pathology 130; Plant Science 102, 105,
107L, 122, 126, 140.

Total Units for the Major105-106

Master Adviser. Contact the Plant Biology Section
Office, 143 Robbins Hall.

Minor Program Requirements:

	UNITS
Plant Biology	23
To satisfy the requirements for a Plant Biology minor, a student must complete Biologi- cal Sciences 1C (or equivalent introduc- tory plant biology course)	5
Upper division units including at least one course from each of the four groups below	18
(a) <i>Anatomy and morphology:</i> Evolution and Ecology 140, Plant Biology 105, 116, 118.	
(b) <i>Physiology and development:</i> Plant Biology 111, 112, 125, Plant Pathology 130.	
(c) <i>Evolution and ecology:</i> Evolution and Ecology 100, Plant Biology 102, 117, Plant Science 103.	
(d) <i>Applied plant biology:</i> Agronomy 100, Plant Science 109, 112, 113, 140, 145	

Minor Adviser. Same as for major above.

Honors and Honors Programs. Students on the hon-
ors list may elect to substitute a maximum of 5 units
of 194H for 5 upper division units of the regular major;
however, recommendations for high honors and high-
est honors at graduation are not dependent on the
completion of 194H. Refer to the Academic Informa-
tion section and the appropriate College section for
Dean's Honors List information.

Teaching Credential Subject Representative. R. M.
Thornton (*Section of Plant Biology*), 218 Robbins Hall.
See also the Teacher Education Program.

Graduate Study. Consult the Plant Biology Graduate
Group listing.

**The Evolution and Ecology
(Zoology) Major Program**

(Section of Evolution and Ecology)

The major in Evolution and Ecology (Zoology) offers
the student a broad background in the theoretical and
empirical basis of our understanding of the diversity
and distribution of living organisms.

The Program. The program of study for the evolution
and ecology major begins with a core of introductory
courses in mathematics, physical sciences, and biol-
ogy. These are followed by survey courses in evolution
and ecology and various more specialized courses

that allow the student to focus his or her studies. Evo-
lution and ecology majors may earn either a Bachelor
of Science or a Bachelor of Arts degree. The require-
ments for the B.S. degree program include more sci-
ence courses, such as biochemistry, whereas those
for the A.B. degree program allow room for more elec-
tives within the humanities and social sciences. The
A.B. degree is especially appropriate for those stu-
dents who wish to combine arts or languages with
evolution and ecology for career preparation in such
areas as scientific writing, translating or illustration.

Career Alternatives. A degree in evolution and ecol-
ogy prepares the student for career opportunities in
research, teaching, health professions, veterinary
medicine, agriculture, environmental management,
and industry. Many students gain some research
experience while at UC Davis and choose to continue
their training at the graduate level. This track offers
careers in academics, government, or business.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	41-45
Biological Sciences 1A-1B-1C	15
Chemistry 2A-2B, 8A-8B	16
Mathematics 16A-16B or Statistics 102	4-6
Physics 1A-1B or 5A-5C	6-8
Depth Subject Matter	36
Biological Sciences 101	4
Biological Sciences 104 or Botany/Zoology 130 (fall quarter 1993 only) or Zoology 121A and Molecular and Cellular Biology 141 (1993-94 only)	4-8
One course from Anthropology 151, Evolution and Ecology 100, Geology 107, 111A	3-4
Additional upper division coursework in bio- logical science to achieve a total of 36 or more units	20-25
Include at least:	
(a) 15 units in Evolution and Ecology (or Zoology)	
(b) one course from two of the four areas of study shown below.	
Total Units for the Major	77-81

Recommended

Biological Sciences 102-103; Geology 3; Physics 5B.

Areas of Study:

- Ecology and behavior:* Environmental Studies 100;
Evolution and Ecology 101, 147, 149; Neurobiology,
Physiology and Behavior 155.
- Systematics, morphology, and natural history:* Ento-
mology 100; Evolution and Ecology 105, 112, 133,
134, 134L, 136, 136L, 137, 137L.
- Developmental biology:* Molecular and Cellular
Biology 150, 150L, 151.
- Physiology:* Molecular and Cellular Biology 142;
Neurobiology, Physiology and Behavior 110, 110L,
142, 142L, 143.

Note: A maximum of 5 units of variable-unit courses
(numbered 192, 198, 199) may be applied to upper
division elective requirements. Evolution and ecology
majors may not substitute course 192 for the upper divi-
sion laboratory requirement. Courses numbered 197T
are not applicable to the upper division elective unit
requirement.

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	57-66
Biological Sciences 1A-1B-1C	15
Chemistry 2A-2B-2C	15
Chemistry 8A-8B or 118A-118B-118C	6-12
Mathematics 16A-16B-16C or 21A-21B-21C	9-12
Physics 5A-5B-5C	12
Depth Subject Matter	49
Biological Sciences 101, 102, 103, 104	13
Evolution and Ecology 100, 101, 102	12
Statistics 100 or 102 or 130A-130B	4-8

*Course not offered this academic year.

Additional upper division course work in biological science to achieve a total of 49 or more units16-20
Include at least:

- (a) 2 units (6 hours/wk) of laboratory, and
(b) one course from each of the areas of study shown below.

Areas of Study:

1. *Biodiversity*: Entomology 100, 100L, 107, 109; Evolution and Ecology 112, 112L, 121, 134, 134L, 136, 136L, 137, 137L; Plant Biology 108, 118, 119; Wildlife and Fisheries Biology 110, 110L, 111, 111L, 120, 120L.

2. *Physiology and functional morphology*: Entomology 102; Environmental Studies 129, 129L; Evolution and Ecology 105, 133, 170, 170L; Neurobiology, Physiology and Behavior 101; Plant Biology 111, 111L, 112, 116.

Note: A maximum of 4 units of variable-unit courses (numbered 192, 198, 199) may be applied to upper division elective requirements. Evolution and ecology majors may not substitute course 192 for the upper division laboratory requirement. Courses numbered 197T are not applicable to the upper division elective unit requirement.

Biological Sciences Electives. The following courses are acceptable toward the fulfillment of the upper division biological sciences requirement in the A.B. and B.S. major programs and may be selected without adviser approval. Other elective courses are approved on an individual basis by petition through an adviser.

Anatomy 100

Anthropology 151, 152, 153, 154A, 154B, 155, 156

Biological Sciences, all upper division courses

Chemistry 107A, 107B

Clinical Pathology 101, 101L

Entomology, all upper division courses except 110, 115

Environmental Studies 110, 116, 121, 123, 150C, 151, 151L

Geology 106, 107, 107L, 111A, 111B, 145, 146, 150C

Microbiology, all upper division courses

Molecular and Cellular Biology, all upper division courses

Nematology 110

Neurobiology, Physiology and Behavior, all upper division courses

Nutrition 110, 111

Philosophy 108

Plant Biology, all upper division courses

Psychology 108, 129, 134, 150

Veterinary Microbiology and Immunology 126, 126L, 128, 132

Wildlife and Fisheries Biology 120, 120L, 121

Total Units for the Major106-115

Major Advisers. Students transferring to Davis from another institution and majoring in evolution and ecology must consult an adviser immediately upon matriculation so that their transfer credits can be applied to the major requirements. All new students in the major should contact the Section of Evolution and Ecology Office for adviser assignment. Substitutions of courses not on the above list for major requirements are arranged through the adviser.

Advising Center for the major is located in 2320 Storer Hall (916-752-8523).

Pre-professional students should establish contact with the Health Sciences Advising Office, South Hall, to learn what specific courses are required on their transcripts.

Teaching Credential Subject Representative. Students planning for a teaching career should consult the Department of Education in regard to preparation for certification. See also the section on the Teacher Education Program.

Divisionwide Programs and Courses

Bodega Marine Laboratory Program

A full quarter of undergraduate course work in marine biology is available each Spring Quarter at the Bodega Marine Laboratory (BML) located in Bodega Bay, California. Course offerings include lecture and laboratory instruction in the developmental biology of marine invertebrates, physiological adaptation of marine organisms, and population biology and ecology; a weekly colloquium; and an intensive individual research experience under the direction of laboratory faculty (Biological Sciences courses 120, 120P, 122, 122P, 123; Neurobiology, Physiology and Behavior 141, 141P). The program is residential, with students housed on the laboratory grounds. Participants are assessed a room and board fee in addition to standard campus registration fees.

Application required. Forms can be obtained from the Division of Biological Sciences. Applications are due on or before the pre-registration deadline for spring quarter. Additional information on the Bodega Marine Laboratory Program is available from the Undergraduate Academic Programs—Division of Biological Sciences Office, 66 Briggs, or BML directly, (707) 875-2211, P.O. Box 247, Bodega Bay, CA 94923.

Courses in Biological Sciences (BIS)

Lower Division Courses

1A. Introductory Biology (5) I, II, III. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: Chemistry 2B (may be taken concurrently). Introduction to biological molecules, bioenergetics, cell structure and function, elements of molecular biology and viruses. Interdisciplinary course for majors in the biological sciences.

1B. Introductory Biology (5) I, II, III. The Staff
Lecture—3 hours; laboratory—3 hours; discussion—1 hour. Prerequisite: course 1A. Continuation of course 1A. Topics covered include transmission genetics, systematics, evolution, survey of the animal kingdom, comparative anatomy, physiology, and adaptation in animals.

1C. Introductory Biology (5) I. Thornton; II. Murphy; III. Bloom/Yoder and O'Neill
Lecture—4 hours; laboratory—3 hours. Prerequisite: course 1B. Continuation of course 1B. Topics covered include a survey of bacteria, protozoa, algae and plants, structure and function of plant tissue, adaptive development and evolution of plants, population ecology, ecosystem analysis and human evolution.

10. General Biology (4) I. Marr; II. Keizer; III. Falk
Lecture—3 hours; discussion—1 hour. Consideration of the main features and principles of biology, with emphasis on biological processes and special reference to evolution, heredity, and the bearing of biology on human life. Designed for students not specializing in biology. Not open for credit to those who have had course 1A. General Education credit: Nature and Environment.

11A-11B. Issues in the Life Sciences (2-2) I, II.

Goldberg

Lecture—1 hour; discussion—1 hour. Prerequisite: enrollment limited to BUSP students; consent of instructor required. Designed to broaden the students' understanding of biology by demonstrating the range of subjects and approaches included in the field of biology. Both basic biological research topics and applied biology will be studied.

***19. Biology of Cancer** (3) III. The Staff

Lecture—3 hours. Prerequisite: course 1A or 10, or Molecular and Cellular Biology 10 or Neurobiology, Physiology and Behavior 10. Interdisciplinary course offers an introduction to the biological, clinical and psycho-social aspects of cancer, and emphasizes basic understanding of biological principles and facts about the disease process. Designed for students with little scientific background. Offered in alternate years.

98. Directed Group Study (1-5) I, II, III. The Staff

(Associate Dean in charge)

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

101. Genes and Gene Expression (4) I. Gottlieb, Rodriguez; II. Dvorak, Sanders; III. Shen and staff
Lecture—4 hours. Prerequisite: course 1B; Chemistry 8B, or 118B or 128B (may be taken concurrently). Nucleic acid structure and function; gene expression and its regulation; replication; transcription and translation; transmission genetics; molecular evolution. Not open for credit to students who have completed Genetics 100. (Former course Genetics 100.)

102. Structure and Function of Biomolecules (3) I. Gasser, Scholey; II. Hilt, Hjelmeland; III. Theg and staff

Lecture—3 hours. Prerequisite: Chemistry 8B or 118B or 128B. Structure and function of macromolecules with emphasis on proteins; enzyme kinetics; supramolecular assemblies; membranes; cytoskeleton; cell motility and cell division. Not open for credit to students who have completed Biochemistry and Biophysics 101A. (Former course Biochemistry and Biophysics 101A.)

103. Bioenergetics and Metabolism (3) I. Doi, Sprechman; II. Callis, Segel; III. Carlson, Segel
Lecture—3 hours. Prerequisite: course 102. Fundamentals of metabolism including glycolysis and oxidative pathways; photosynthesis; biosynthesis of amino acids, nucleic acids and proteins. Not open for credit to students who have completed Biochemistry and Biophysics 101B. (Former course Biochemistry and Biophysics 101B.)

104. Regulation of Cell Function (3) I. Nuccitelli; II. The Staff; III. Etzler

Lecture—3 hours. Prerequisite: course 101 and 102; course 103 recommended. Membrane receptors and signal transduction; cell trafficking; cell cycle, cell growth and division; extracellular matrix and cell-cell junctions; cell development; immune system. Not open for credit to students who have completed Botany/Zoology 130, Physiology 100A or Zoology 121A. (Former courses Botany/Zoology 130, Physiology 100A, Zoology 121A.)

120. Developmental Biology of Marine Invertebrates (4) III. Jeffery (Molecular and Cellular Biology)

Lecture—30 hours total; laboratory—30 hours total. Prerequisite: Molecular and Cellular Biology 150-150L, Biological Sciences 102 and 103; course 123 concurrently. Phylogenetic patterns of reproduction and development among the marine invertebrates. Emphasis on both modern and classical approaches to understanding gametogenesis, gamete interaction and fertilization, cleavage, cell differentiation, morphogenesis, and larval development and metamorphosis. Course offered at Bodega Marine Laboratory. (See above description for Bodega Marine Laboratory Program.)

120P. Developmental Biology of Marine Invertebrates/Advanced Laboratory Topics (6) III. Jeffery (Molecular and Cellular Biology)

Laboratory—150 hours total; discussion—10 hours total. Prerequisite: course 120 concurrently. Students pick a research topic for intense study. Research will be related to a topic covered in course 120 and will be conducted at the Bodega Marine Laboratory with close supervision of resident faculty. (See above description for Bodega Marine Laboratory Program.)

122. Population Biology and Ecology (4) III. Strong (Evolution and Ecology)

Lecture—30 hours total; laboratory—30 hours total. Prerequisite: lower division core in biological sciences; course 123 concurrently. Population and community processes. Emphasis on biological and physical processes affecting plant and animal populations in the array of habitats at the ecological reserve. Modelling as a basis for designing experiments. Course offered at Bodega Marine Laboratory. (See above description for Bodega Marine Laboratory Program.)

122P. Population Biology and Ecology/Advanced Laboratory Topics (6) III. Strong (Evolution and Ecology)

Laboratory—150 hours total; discussion—10 hours total. Prerequisite: course 122 concurrently. Students pick a research topic for intense study. Research will be related to a topic covered in course 122 and will be conducted at the Bodega Marine Laboratory with close supervision of resident faculty. (See above description for Bodega Marine Laboratory Program.)

123. Undergraduate Colloquium in Marine Science (1) III. The Staff

Seminar—1 hour. Prerequisite: enrolled student at the Bodega Marine Laboratory. Series of weekly seminars by recognized authorities in various disciplines of marine science from within and outside the UC system. Includes informal discussion with speaker. Course will be held at Bodega Marine Laboratory. (P/NP grading only.) (See above description for Bodega Marine Laboratory Program.)

194H. Research Honors (2) I, II, III. The Staff (Associate Dean in charge)

Independent study—6 hours. Prerequisite: senior standing. Students majoring in Biological Sciences who have completed two quarters (3-5 units per quarter) of 199 and who qualify for the honors program as defined by the current catalog. Opportunity for Biological Sciences majors to pursue intensive research culminating in the writing of a senior thesis with the guidance of faculty advisers. (P/NP grading only.)

197T. Tutoring in Biological Sciences (1-3) I, II, III. The Staff (Associate Dean in charge)

Prerequisite: upper division standing; appropriate background in biological sciences. Assisting in courses in Biological Sciences under the direction of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Associate Dean in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses**298. Group Study** (1-5) I, II, III. The Staff (Associate Dean in charge)

Prerequisite: consent of instructor. Division of Biological Sciences staff members may offer group study courses under this number.

Professional Course**310. Effective Teaching of College Biology** (2) II. Thornton (Plant Biology)

Informal lecture/discussion—2 hours. Teaching function of an academic career; objectives, nature, and methods of effective teaching; design of curricula and courses; lecturing and leading discussions; examinations and grading; evaluation; counseling; innovation. (S/U grading only.)

Sections of the Division of Biological Sciences**Biological Sciences: Evolution and Ecology**

Thomas W. Schoener, Ph.D., Chairperson of the Section

Section Office, 2320 Storer Hall (916-752-1272)

Faculty**Primary Section Members**

James A. Doyle, Ph.D., Professor
Olaf W. J. Ellers, Ph.D., Assistant Professor
John H. Gillespie, Ph.D., Professor
Leslie D. Gottlieb, Ph.D., Professor
Richard K. Grosberg, Ph.D., Associate Professor

Charles H. Langley, Ph.D., Professor
Marc Mangel, Ph.D., Professor
Marcel Rejmanek, Ph.D., Professor
Thomas W. Schoener, Ph.D., Professor
H. Bradley Shaffer, Ph.D., Associate Professor
Arthur M. Shapiro, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*
Judy A. Stamps, Ph.D., Professor
Maureen L. Stanton, Ph.D., Professor
Donald R. Strong, Ph.D., Professor
Catherine A. Toft, Ph.D., Professor
Michael Turelli, Ph.D., Professor

Secondary Section Members

Peter R. Marler, Ph.D., Professor
Robert W. Pearcy, Ph.D., Professor

Emeriti Faculty

Daniel I. Axelrod, Ph.D., Professor Emeritus
Milton Hildebrand, Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award*

Everett W. Jameson, Ph.D., Professor Emeritus
Jack Major, Ph.D., Professor Emeritus
Milton A. Miller, Ph.D., Professor Emeritus
Timothy Prout, Ph.D., Professor Emeritus
Robert L. Rudd, Ph.D., Professor Emeritus
George W. Salt, Ph.D., Professor Emeritus
G. Ledyard Stebbins, Ph.D., Professor Emeritus
Kenneth E. F. Watt, Ph.D., LL.D., Professor Emeritus
Grady L. Webster, Ph.D., Professor Emeritus
Stephen L. Wolfe, Ph.D., Lecturer Emeritus

Courses in Evolution and Ecology (EVE)**Lower Division Courses****92. Internship** (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in all subject areas offered in the Section of Evolution and Ecology. Internships supervised by a member of the faculty. (Former course Zoology 92.) (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge)

Former course Zoology 99. (P/NP grading only.)

Upper Division Courses**100. Introduction to Evolution** (4) I. Langley; II. Turelli; III. Stanton

Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1A, 1B, 1C, and 101, and Mathematics 16A, 16B, 16C or the equivalent. A general survey of the origins of biological diversity and evolutionary mechanisms. Not open for credit to students who have completed Botany 100, Genetics 103, Zoology 148. (Former courses Botany 100, Genetics 103, Zoology 148.)

101. Introduction to Ecology (4) I. Mangel; II. Toft; III. Shapiro

Lecture—3 hours; lecture/discussion—1 hour. Prerequisite: Biological Sciences 1A, 1B, 1C; Mathematics 16A, 16B, 16C or the equivalent. A general survey of the principles of ecology. Not open for credit to students who have completed Zoology 125. (Former course Zoology 125.)

102. Advanced Evolution (4) II. Doyle, Gillespie
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100. Advanced topics and current issues in microevolution and macroevolution, including population genetics, quantitative genetics, evolutionary stable strategies, speciation, phylogeny reconstruction, analyses of fossil and molecular data, macroevolutionary mechanisms, and global diversity trends. Not open to students who have completed Genetics 105 or 106. (Former courses Genetics 105, 106.)

***105. Phylogenetic Analysis of Vertebrate Structure** (4) I. The Staff

Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B. The structure of the classes and subclasses of vertebrates is described and interpreted in terms of phylogeny. Not open to

students who have completed Zoology 105. (Former course Zoology 105.)

112. Invertebrate Zoology (4) II. Ellers, Grosberg
Lecture—4 hours. Prerequisite: Biological Sciences 1A, 1B; course 112L (concurrently); courses in systematics, ecology, and evolution recommended. Survey of the invertebrate phyla emphasizing aquatic forms and focusing on morphology, development, natural history, and phylogenetic relationships. Not open to students who have completed Zoology 112. (Former course Zoology 112.)

112L. Laboratory for Invertebrate Zoology (3) II. Ellers, Grosberg

Discussion—1 hour; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B; course 112 concurrently. Field and laboratory experience with representative members of the invertebrate phyla discussed in course 112. Emphasis on comparative morphology, natural history, ecology, and behavior of living invertebrates. Not open to students who have completed Zoology 112L. (Former course Zoology 112L.)

117. Plant Ecology (4) I. Stanton, Pearcy
Lecture—3 hours; three to five field trips. Prerequisite: Biological Sciences 1A, 1B, 1C; Plant Biology 112; Plant Biology 102 or 108 strongly recommended. The study of interactions between plant populations or vegetation types and their environment. Special emphasis on California. Students taking course 117 cannot receive credit for Plant Biology 101. (Same course as Plant Biology 117.) Not open to students who have completed Botany 117. (Former course Botany 117.)

121. Survey of Plant Communities of California (4) III. Barbour

Lecture—2 hours; fieldwork—1 hour; term paper—1 hour. Prerequisite: Biological Sciences 1C recommended; consent of instructor required. Structure of selected plant communities and the relationship of their component species to the environment. Especially recommended for non-majors. General Education credit: Nature and Environment. Not open to students who have completed Plant Biology 101 or Botany 101. (Former courses Plant Biology 101, Botany 101.)

***133. Patterns in Vertebrate Biology** (3) II. The Staff

Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B. Vertebrate thermoregulation and water balance, circadian and circannual activity, communication, breathing, movements and feeding patterns. Not open to students who have completed Zoology 133. (Former course Zoology 133.)

134. Herpetology (3) III. Shaffer

Lecture—2 hours; term paper. Prerequisite: Biological Sciences 1A, 1B; Evolution and Ecology 100 recommended. The world-wide diversity of amphibians and reptiles with emphasis on behavior, ecology, functional morphology, and evolutionary history. Offered in alternate years. Not open to students who have completed Zoology 134. (Former course Zoology 134.)

134L. Herpetology Laboratory (2) III. Shaffer

Laboratory—6 hours; two weekend field trips. Prerequisite: Biological Sciences 1A, 1B; course 134 concurrently. Diagnostic characteristics and functional attributes of amphibians and reptiles, emphasizing ecological, biogeographic and phylogenetic patterns. Field trips will acquaint students with techniques for identifying and studying amphibians and reptiles under natural conditions. Offered in alternate years. Not open to students who have completed Zoology 134L. (Former course Zoology 134L.)

***136. Mammalogy** (2) I. The Staff

Lecture—2 hours. Prerequisite: course 101 or equivalent general course in ecology. Systematics, life history, reproduction, distribution, and physiology of wild mammals. Not open to students who have completed Zoology 136. (Former course Zoology 136.)

***136L. Mammalogy Laboratory** (3) I. The Staff
Laboratory—6 hours; extensive weekend field-trips. Prerequisite: course 101 or 136, and consent of instructor. Systematics of California mammals; techniques of study in professional mammalogy. May be

taken concurrently with course 136. Not open to students who have completed Zoology 136L. (Former course Zoology 136L.)

137. Ornithology (2) II. Weathers (Avian Sciences) Lecture—2 hours. Prerequisite: course 101 or the equivalent course in ecology. Systematics, distribution, physiology, and population dynamics of birds. Students who have had Wildlife and Fisheries Biology 111 may not receive credit for this course. Not open to students who have completed Zoology 137. (Former course Zoology 137.)

137L. Ornithology Laboratory (3) II. The Staff Laboratory—6 hours. Prerequisite: course 101 or 137 (may be taken concurrently) and consent of instructor. Individual study and field trips strongly emphasized. Systematics, behavior, population dynamics, and reproduction of California birds. Not open to students who have completed Zoology 137L. (Former course Zoology 137L.)

138. Ecology of Tropical Latitudes (3) II. Shapiro Lecture—3 hours. Prerequisite: any one of the following: Biological Sciences 1A, 1B, or 10, Plant Biology 10, Geography 2 or 2G, or Wildlife and Fisheries Biology 10. Biological, physical, and human-related aspects of the ecology of low latitudes. Distribution, numbers, and relationships of tropical organisms. Problems of development and conservation in the context of ecological and evolutionary theory. Offered in alternate years. Not open to students who have completed Zoology 138. (Former course Zoology 138.) General Education credit: Nature and Environment.

140. Paleobotany (4) I. Doyle Lecture—3 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Introduction to plant fossil record, beginning with invasion of land in the Silurian, emphasizing origin and evolution of major groups and adaptations and changing composition and distribution of floras in relation to plate tectonics and climatic change. Not open to students who have completed Botany 140. (Former course Botany 140.)

141. Principles of Systematic Zoology (3) II. Shapiro Lecture—2 hours; biweekly research projects. Prerequisite: Biological Sciences 1B or 1C; course 100 recommended. Historical background, philosophical rationale, contemporary approaches, and working rules of animal biosystematics, including International Code of Zoological Nomenclature. Offered in alternate years. Not open to students who have completed Zoology 141. (Former course Zoology 141.)

***144. Plant Geography (4) II.** Elliot-Fisk (Geography) Lecture—3 hours; laboratory—3 hours. Prerequisite: upper division course in plant ecology or taxonomy, i.e., one of courses Evolution and Ecology 117, Geography 102, or Plant Biology 101, 102, 108, 121. The worldwide distribution of the major plant communities and taxa is reviewed with respect to the historical background and the theoretical principles of biogeography. Laboratory studies introduce students to the interpretation of data and testing of biogeographical hypotheses. Offered in alternate years. Not open to students who have completed Botany 144. (Former course Botany 144.)

***147. Zoogeography (4) I.** Shapiro Lecture—3 hours; term paper. Prerequisite: Biological Sciences 1A, 1B. Movements of terrestrial animals. The role of geologic, climatic, and biological changes in the geographic distribution of animals. Offered in alternate years. Not open to students who have completed Zoology 147. (Former course Zoology 147.)

***149. Evolution of Ecological Systems (4) I.** Shapiro Lecture—3 hours; term paper. Prerequisite: course 101 or Environmental Studies 100 (or the equivalent) and course 100 (or the equivalent). Evolution as an organizing force in natural communities. Coadaptation in trophic and competitive relationships. Ecology of polymorphisms, clines, and speciation. Offered in alternate years. Not open to students who have completed Zoology 149. (Former course Zoology 149.)

***170. Comparative Biomechanics (3) I.** Ellers Lecture—3 hours. Prerequisite: Physics 5A and 5B, Mathematics 16A, 16B, and 16C, Biological Sciences

1B. Biomechanics and functional morphology of vertebrates and invertebrates. Emphasis on physical laws that provide design principles for a wide range of organisms. Principles from fluid and solid mechanics, acoustics and vibration. Locomotion, skeletal morphology, biological materials, and waves. Offered in alternate years. Not open to students who have completed Zoology 170. (Former course Zoology 170.)

***170L. Comparative Biomechanics Laboratory (3) I.** Ellers Laboratory—6 hours; term paper. Prerequisite: Physics 5A and 5B, Mathematics 16A, 16B, and 16C, Biological Sciences 1B; course 170 recommended to be taken concurrently. Experimental techniques for measuring physical quantities relevant to organismal designs. Demonstrations of principles in fluid, solid, and acoustical mechanics. Emphasis on use of electronic transducers and computerized data collection. Includes a student-designed research project. Offered in alternate years. Not open to students who have completed Zoology 170L. (Former course Zoology 170L.)

189. Introduction to Biological Research (1) I, II, III. The Staff (Chairperson in charge) Discussion—1 hour. Prerequisite: upper division standing in Zoology or related biological science; consent of instructor. Introduction to research methods in biology. Presentation and discussion of research by faculty, graduate, and undergraduate students. May be repeated for credit up to a total of 3 units. (Former course Zoology 189.) (P/NP grading only.)

190. Undergraduate Seminar (2) I, II, III. The Staff Seminar—2 hours. Prerequisite: upper division standing in the biological sciences or a related discipline. Student reports on current topics with emphasis on integration of concepts, synthesis, and state-of-the-art research approaches. Reviews of literature and reports of undergraduate research may be included. May be repeated for credit. (Former course Zoology 190.) (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge) Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in all subject areas offered in the Section of Evolution and Ecology. Internships supervised by a member of the faculty. Former course Zoology 192. (P/NP grading only.)

194HA-194HB-194HC. Research Honors (2) I, II, III. The Staff Laboratory—6 hours. Prerequisite: Students who have completed 135 units and qualify for the honors program (as defined by the current catalog). Students pursue intensive research under the guidance of a faculty adviser. Students are expected to complete the full three-quarter sequence culminating in the writing of an honors thesis. Not open to students who have completed Zoology 194HA-194HB-194HC. (Former course Zoology 194HA-194HB-194HC.) (Deferred grading only, pending completion of sequence.)

197T. Tutoring (1-5) I, II, III. The Staff Tutorial—1-5 hours. Prerequisite: upper division standing. Experience in teaching under guidance of the staff. Former course Zoology 197T. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge) Former course Zoology 198. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) Former course Zoology 199. (P/NP grading only.)

Graduate Courses

221. Behavioral Ecology (3) III. Mangel, Stamps Lecture—3 hours. Prerequisite: course 101 or Neurobiology, Physiology and Behavior 155 or the equivalent, and graduate standing. Introduction to the main issues treated in modern behavioral ecology, the main experimental techniques used to treat these issues and the major theoretical methods used to develop predictive models. Offered in alternate years. Not open to students who have completed Zoology 221. (Former course Zoology 221.)

***240. Paleobotany and Angiosperm Evolution (4) III.** Doyle Lecture—3 hours; laboratory—3 hours. Prerequisite: Plant Biology 108, 116, or Evolution and Ecology 140. Critical analysis of the plant fossil record as a source of evidence on origin, evolution, and phylogeny of the angiosperms, Cretaceous and Tertiary climates, geographic history of modern taxa, and origin of modern vegetation types. Offered in alternate years. Not open to students who have completed Botany 240. (Former course Botany 240.)

***243. Palynology (4) I.** Doyle Lecture—2 hours; laboratory—6 hours. Prerequisite: Plant Biology 108, 116, or Evolution and Ecology 140. Morphology of spores and pollen grains and their use in stratigraphy, plant systematics and evolution, and paleoecology. Techniques for study of modern spores and pollen and extraction and identification of fossil palynomorphs from sediments of Paleozoic to Quaternary age. Offered in alternate years. Not open to students who have completed Botany 243. (Former course Botany 243.)

287. Seminar in Animal Behavior (2) III. Stamps Seminar—2 hours. Prerequisite: consent of instructor. Reports and discussion on the principles and recent developments in invertebrate and vertebrate animal behavior. Not open to students who have completed Zoology 287. (Former course Zoology 287.)

290. Current Topics (1) I, II, III. The Staff Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Seminars presented by guest lecturers describing their research activities. May be repeated for credit. Former course Zoology 290. (S/U grading only.)

290C. Research Conference (1) I, II, III. The Staff Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Presentation and discussion of faculty and graduate student research in biology. May be repeated for credit. Former course Zoology 290C. (S/U grading only.)

***294. Seminar in Animal Ecology (3) III.** The Staff Seminar—3 hours. Prerequisite: course 101 and graduate standing. Readings and discussions of advanced topics in the population and community ecology of animals. Not open to students who have completed Zoology 294. (Former course Zoology 294.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge) Former course Zoology 298. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) Former course Zoology 299. (S/U grading only.)

Professional Course

390. Methods of Teaching (2) I, II, III. The Staff Lecture—1 hour; discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Practical experience in the methods and problems of teaching. Includes analyses of texts and supporting material, discussion of teaching techniques and preparing and conducting of laboratory and discussion sections. May be repeated for credit for a maximum of 8 units. Former course Zoology 390. (S/U grading only.)

Biological Sciences: Microbiology

Stephen C. Kowalczykowski, Ph.D., Chairperson of the Section

Section Office, 156 Hutchison Hall (916-752-0262)

Faculty

Primary Section Members

Stanley W. Artz, Ph.D., Professor
Paul Baumann, Ph.D., Professor
Michele M. Igo, Ph.D., Assistant Professor
Daniel J. Klionsky, Ph.D., Assistant Professor
Stephen C. Kowalczykowski, Ph.D., Professor

Jarue S. Manning, Ph.D., Professor
John C. Meeks, Ph.D., Professor
Douglas C. Nelson, Ph.D., Associate Professor
Martin L. Privalsky, Ph.D., Professor
Merna R. Villarejo, Ph.D., Professor
Mark L. Wheelis, Ph.D., Senior Lecturer

Secondary Section Members

Irwin H. Segel, Ph.D., Professor

Emeriti Faculty

Robert E. Hungate, Ph.D., Professor Emeritus
John L. Ingraham, Ph.D., Professor Emeritus
Allen G. Marr, Ph.D., Professor Emeritus
Herman J. Phaff, Ph.D., Professor Emeritus
David Pratt, Ph.D., Professor Emeritus

Courses in Microbiology (MIC)

Lower Division Courses

***20. Biology of Microorganisms (4) II.** The Staff
Lecture—3 hours; term paper. Prerequisite: Biological Sciences 10. Survey of the diversity of microorganisms (viruses, bacteria, protists), their metabolism, genetics, and habitats. Emphasis on importance to humans—role of microorganisms in global element cycles, in food production, and in disease. General Education credit: Nature and Environment.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

102. General Bacteriology (4) I, II, III. Smith
Lecture—4 hours. Prerequisite: Biological Sciences 1A and Chemistry 8B (may be taken concurrently). Survey of the biology of bacteria and viruses, including bacterial structure, metabolism, physiology, genetics, and evolution; viral structure and replication; the role of bacteria in global element cycles; and the role of microbes in infectious disease. Only two units of credit allowed to students who have previously passed course 2.

102L. General Bacteriology Laboratory (2) I, II, III. Smith
Laboratory—6 hours. Prerequisite: course 102 (may be taken concurrently). Introduction to principles and laboratory methods employed in working with microorganisms. For students planning to continue study of microbiology, or use microorganisms as tools for study of genetics and biochemistry. Only one unit of credit allowed if course 3 has been taken.

105. Bacterial Diversity (5) II. Nelson, Baumann
Lecture—3 hours; laboratory—6 hours. Prerequisite: courses 102, 102L, and Biological Sciences 102; Biological Sciences 103 recommended. Survey of the major groups of bacteria emphasizing diversity of energy metabolism, morphology and natural history. Includes methods for determination of evolutionary relationships among groups. Isolation and characterization of bacterial strains from various habitats.

110. Bacteriology of Insects (3) III. Baumann
Lecture—3 hours. Prerequisite: course 102; Biological Sciences 102. Physiological basis of pathogenic and symbiotic associations between prokaryotes and insects. Taxonomy, physiology, pathogenesis, and molecular biology of insect pathogens. Insect immunity. Nutritional associations between microorganisms and insects. Pertinent entomological background information will be included.

120. Microbial Ecology (3) III. Meeks
Lecture—3 hours. Prerequisite: course 105, Biological Sciences 102. Interactions between non-pathogenic microorganisms and their environment, emphasizing physiological and metabolic characteristics of various groups and their adaptation to and modification of specific habitats.

120L. Microbial Ecology Laboratory (2) III. Meeks
Laboratory—6 hours; one optional overnight weekend field trip. Prerequisite: course 120 (may be taken concurrently); consent of instructor. Study of prokaryotic microorganisms from certain habitats. One-half of laboratory effort will consist of organized experiments on

ecologically important microbial activities. For remaining one-half, research projects will be done on student selected specific habitats of microorganisms. Limited enrollment.

130A. Bacterial Physiology and Genetics (3) I. Igo
Lecture—3 hours. Prerequisite: course 102; Biological Sciences 103 (may be taken concurrently); Mathematics 16A. Physiology and regulation of bacterial growth including the effect of the environment. Mapping techniques and use of mutants in problem solving.

130B. Bacterial Physiology and Genetics (3) III.

Artz, Kowalczykowski

Lecture—3 hours. Prerequisite: course 130A. Gene regulation. Prokaryotic nitrogen metabolism. Structure and function of the bacterial cell envelope; synthesis of peptidoglycan and lipopolysaccharide; active transport of nutrients; chemotaxis.

130L. Bacterial Physiology Laboratory (3) III. Artz
Laboratory—9 hours. Prerequisite: course 130A and course 102L. Physiology and genetics of bacteria and bacterial viruses. Isolation and characterization of mutant strains. Mapping of mutations by conjugation and transduction. Studies on control of enzyme synthesis by induction, repression and catabolic repression.

162. General Virology (4) I. Manning

Lecture—4 hours. Prerequisite: Biological Sciences 1A, 102. Integrated presentation of the nature of animal, bacterial, and plant viruses, including their structure, replication and genetics.

177. Metabolism of Anaerobic Bacteria (3) II. Macy (Animal Science)

Lecture—3 hours. Prerequisite: course 102; Biological Sciences 103 (may be taken concurrently). Various groups of anaerobic and facultatively anaerobic bacteria, a consideration of their natural environments and their metabolic characteristics, with emphasis on energy yielding catabolic pathways.

177L. Laboratory in Metabolism of Anaerobic Bacteria (2) II. Macy (Animal Science)

Laboratory—6 hours. Prerequisite: course 102L; course 177 (may be taken concurrently). Isolation of anaerobic bacteria from a number of different natural environments; experiments dealing with certain characteristic physiological and metabolic aspects of anaerobic bacteria. Offered in alternate years.

190C. Undergraduate Research Conference (1) I,

II, III. The Staff (Chairperson in charge)
Discussion/conference—1 hour. Prerequisite: upper division standing; consent of instructor. Presentation and critical discussion of staff research activities; designed for advanced undergraduate students. May be repeated for a maximum of 3 units of credit when subject matter differs. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Technical and/or professional experience on or off campus. Supervised by a member of the Microbiology Section faculty. (P/NP grading only.)

194H. Microbiology Honors Research (2) I, II, III.

The Staff

Independent study—6 hours. Prerequisite: senior standing; eligibility for college honors; completion of six units of 199 in microbiology; consent of section. Continuation of an individual microbiological research project culminating in writing of a senior thesis under a faculty director. (P/NP grading only.)

197T. Tutoring in Microbiology (1-5) I, II, III. The Staff (Chairperson in charge)

Tutoring—1-5 hours. Prerequisite: course 102L and 18 upper division units in Microbiology; consent of chairperson. Assist in undergraduate laboratory courses supervised by teaching assistants or faculty; in discussion sections supervised by faculty; and staffing "drop-in" offices for individual help. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200A-200B-200C. Microbiology for First-Year Graduate Students (3-3-3) I-II-III. The Staff (Nelson in charge)

Lecture—3 hours. Prerequisite: first-year graduate standing with interest in microbiology. A survey of general microbiology at the graduate level.

201L. Advanced Microbiology Laboratory Rotations (5) I, II, III. The Staff

Laboratory—15 hours. Prerequisite: course 200A (may be taken concurrently). Two five-week assignments in microbiology research laboratories. Individual research problems with emphasis on methodological/procedural experience and experimental design. May be repeated twice for credit.

210. Molecular Mechanisms in Microbial Pathogenesis (3) II. Manning, Hirsh (Pathology, Microbiology and Immunology)

Lecture—3 hours. Prerequisite: course 105 or Veterinary Microbiology 127 and course 162 or Veterinary Microbiology 128 or the equivalent. Study of the molecular mechanisms involved in cytopathogenesis of higher eukaryotic organisms. Emphasis on the alteration or inhibition of cellular metabolism and function by bacteria and animal viruses.

***215. Recombinant DNA (2) I.** Privalsky

Lecture—2 hours. Prerequisite: courses 130A-130B or Biological Sciences 101, 102 and 103. Application of the recombinant DNA technology to modern problems in biology, biochemistry and genetics, emphasizing molecular cloning strategies, choice of vectors, preparation of insert DNA and selection procedures.

***215L. Recombinant DNA Laboratory (4) I.**

Privalsky

Laboratory/discussion—10 hours. Prerequisite: course 130L or Molecular and Cellular Biology 120L; Biological Sciences 101; consent of instructor. Application of the recombinant DNA technology to modern problems in biology, biochemistry and genetics, emphasizing molecular cloning strategies, choice of vectors, preparation of insert DNA and selection procedures. (Submit application, available from Microbiology Section Office, two weeks prior to first day of class.)

***240. Biology of Autotrophic Prokaryotes (3) I.**

Meeks, Wheelis

Lecture/discussion—3 hours. Prerequisite: Biological Sciences 103. Biochemistry and ecology of photo- and chemoautotrophic bacteria, and of methylotrophic bacteria, with special emphasis on the mechanisms of ATP and reductant generation. Offered in alternate years.

***250. Biology of Yeasts (5) I.** Bisson (Viticulture and

Enology), C. Price (Food Science and Technology)
Lecture—3 hours; laboratory—6 hours. Prerequisite: consent of instructor. Survey of the genetics, physiology, regulatory mechanisms, structure, ecology and diversity of yeasts and related organisms. Offered in alternate years.

***260. Bacterial Genetic Regulatory Mechanisms (3) I.** Artz

Lecture/discussion—3 hours. Prerequisite: general knowledge of nucleic acid biochemistry and bacterial genetics. Analysis at the molecular level of genetic regulation in selected bacterial systems. Specific systems discussed will include the following types of regulation: control of transcription initiation and termination; translational controls; tRNA modification effects; autoregulation; control circuits in bacterial viruses; supercontrols. Offered in alternate years.

262. Advanced General and Molecular Virology (3) III. Manning, Luciw (Medical Pathology), Bruening (Plant Pathology)

Lecture—3 hours. Prerequisite: graduate standing. Advanced integrated presentation of animal, bacterial, and plant viruses, including their structure, modes of regulation, expression and replication, and effects on host cells and organisms.

***263. Principles of Protein-Nucleic Acid Interactions** (3) III. Kowalczykowski

Lecture—3 hours. Prerequisite: advanced graduate standing and completion of one year of basic graduate coursework in biochemistry, biophysics, chemistry, genetics, microbiology, or molecular biology. Physical basis of protein-nucleic acid interaction. Topics include nucleic acid recognition by proteins, thermodynamics of protein-nucleic acid stability, and kinetics of binding process for both non-specific and sequence-specific nucleic acid binding proteins. Emphasis on systems that represent paradigms in protein-nucleic acid interactions. Offered in alternate years.

***270. Advanced Animal Virology** (3) III. Manning, Privalsky

Lecture—3 hours. Prerequisite: consent of instructor. Selected advanced topics on biological and biochemical properties of animal viruses. May be repeated for credit. Offered in alternate years.

290C. Advanced Research Conference (1) I, II, III. The Staff (Chairperson in charge)

Discussion/conference—1 hour. Prerequisite: graduate standing and/or consent of instructor. Presentation and critical discussion of staff research activities. Designed for advanced graduate students. May be repeated for credit. (S/U grading only.)

291. Selected Topics in Microbiology (1) I, II, III. The Staff

Seminar—1 hour. Current progress in microbiology and cellular and molecular biology. (S/U grading only.)

292. Seminar in Bacterial Physiology, Genetics and Virology (1) I, II, III. The Staff

Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of current literature and developments in bacterial physiology, genetics, and virology with presentations by individual students. (S/U grading only.)

293. Seminar in Protein Sorting (1) I, II. Klionsky

Seminar—1 hour. Prerequisite: consent of instructor. Reading, presentation and discussion of current research papers on the topics of organelle biogenesis, protein sorting and secretion. (S/U grading only.)

296. Seminar in Animal Virology (1) II. Manning

Seminar—1 hour. Prerequisite: consent of instructor. Discussion of current topics in animal virology. (Same course as Pathology, Microbiology and Immunology 292A.) (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

Carol A. Erickson, Ph.D., Professor
Marilynn E. Etzler, Ph.D., Professor
Charles S. Gasser, Ph.D., Associate Professor
Robert D. Grey, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*

R. Scott Hawley, Ph.D., Professor
Jerry L. Hedrick, Ph.D., Professor
Leonard M. Hjelmeland, Ph.D., Professor (*Biological Chemistry*)

William R. Jeffery, Ph.D., Professor
John A. Kiger, Ph.D., Professor
J. Clark Lagarias, Ph.D., Professor
R. Marc Learned, Ph.D., Assistant Professor
Mark G. McNamee, Ph.D., Professor
Gregg B. Morin, Ph.D., Assistant Professor
Jeanette E. Natzle, Ph.D., Associate Professor
Richard L. Nuccitelli, Ph.D., Professor
Raymond L. Rodriguez, Ph.D., Professor
Mark F. Sanders, Ph.D., Lecturer
Carl W. Schmid, Ph.D., Professor (*Chemistry*)
Jonathan M. Scholey, Ph.D., Associate Professor
Irwin H. Segel, Ph.D., Professor
Che-Kun J. Shen, Ph.D., Lecturer
Larry R. Sprechman, Ph.D., Lecturer

Secondary Section Members

Ernest S. Chang, Ph.D., Professor (*Animal Science*)
Richard H. Falk, Ph.D., Professor
Leslie D. Gottlieb, Ph.D., Professor
John J. Harada, Ph.D., Associate Professor
Daniel J. Klionsky, Ph.D., Assistant Professor
Stephen C. Kowalczykowski, Ph.D., Professor
William J. Lucas, Ph.D., Professor
Brian Muloney, Ph.D., Professor
Sharman O'Neill, Ph.D., Assistant Professor
Pamela A. Pappone, Ph.D., Associate Professor
Martin L. Privalsky, Ph.D., Professor
Steven M. Theg, Ph.D., Assistant Professor
Robert M. Thornton, Ph.D., Senior Lecturer, *Academic Senate Distinguished Teaching Award*

Larry N. Vanderhoeft, Ph.D., Professor
Merna R. Villarejo, Ph.D., Professor
Martin Wilson, Ph.D., Professor

Emeriti Faculty

Paul A. Castellfranco, Ph.D., Professor Emeritus
Sterling Chaykin, Ph.D., Professor Emeritus
Eric E. Conn, Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award, UC Davis Prize for Teaching and Scholarly Achievement*
Gordon J. Edlin, Ph.D., Professor Emeritus
Melvin M. Green, Ph.D., Professor Emeritus
Lloyd L. Ingraham, Ph.D., Professor Emeritus
Paul K. Stumpf, Ph.D., Professor Emeritus

Courses in Molecular and Cellular Biology (MCB)**Lower Division Courses****10. Introduction to Human Heredity** (4) I. Sanders; III. Hawley

Lecture—3 hours; discussion—1 hour. Topics in human heredity and human gene structure and function, including the genetic basis of human development, causes of birth defects, mental retardation, genetic diseases, sexual determination, development and behavior. Not open to students who have received credit for Genetics 10. (Former course Genetics 10.) General Education credit: Nature and Environment.

99. Special Study (1-5) I, II, III. The Staff

Independent study—3-15 hours. Prerequisite: consent of instructor. Directed research study for undergraduate students. (Former course Genetics 99.) (P/NP grading only.)

Upper Division Courses

120L. Biochemistry Laboratory (6) I. Hedrick, Hiit, Sprechman; II. Fairclough (Neurology), Lagarias, Segel; III. Doi, Hiit, Criddle, Sprechman
Laboratory—10 hours; lecture—2 hours; laboratory/discussion—1 hour. Prerequisite: Biological Sciences 103 (may be taken concurrently). Introduction to laboratory methods and procedures employed in studying biochemical processes. Designed for students who need experience in the use of biochemical techniques as laboratory tools. Not open to students who have received credit for Biochemistry and Biophysics 101L. (Former course Biochemistry and Biophysics 101L.)

121. Molecular Biology of Eukaryotic Cells (3) II. Dahmus
Lecture—3 hours. Prerequisite: Biological Sciences 103 and course 120L. Structure, expression and regulation of eukaryotic genes. Chromosome structure and replication; gene structure, transcription and RNA processing; protein synthesis and translation control; development, immune system and oncogenes. Not open to students who have received credit for Biochemistry and Biophysics 153. (Former course Biochemistry and Biophysics 153.)

122. Structure and Function of Proteins (3) I. Criddle

Lecture—3 hours. Prerequisite: course 120L, Biological Sciences 103. Correlation of structure and biological function. Molecular models of enzymes that explain their physiological functioning. Physical and chemical methods used in determining protein structure. Function as measured by kinetic and binding models and as affected by physiological considerations. Not open to students who have received credit for Biochemistry and Biophysics 143. (Former course Biochemistry and Biophysics 143.)

123. Behavior and Analysis of Enzyme and Receptor Systems (3) III. Segel

Lecture—3 hours. Prerequisite: Biological Sciences 103. Introduction to the principles of enzyme kinetics and receptor-ligand interactions with emphasis on metabolic regulation and data analyses. Topics include simultaneous equilibria, chemical and steady-state kinetics, allosteric enzymes, multireactant systems, enzyme assays, membrane transport and computer-assisted simulations and analysis. Not open to students who have received credit for Biochemistry and Biophysics 133. (Former course Biochemistry and Biophysics 133.)

126. Plant Biochemistry (3) III. Callis, Theg

Lecture—3 hours. Prerequisite: Biological Sciences 103. The chemistry of important plant processes and constituents in photosynthesis and respiration; carbohydrate, fat and nitrogen metabolism. Not open to students who have received credit for Biochemistry and Biophysics 122. (Former course Biochemistry and Biophysics 122.)

138. Undergraduate Seminar in Biochemistry (1) I. Etzler; II. Sprechman; III. Callis

Seminar—1 hour. Prerequisite: Biological Sciences 103. Discussion of the historical developments of modern biochemistry or current major research problems. Not open to students who have received credit for Biochemistry and Biophysics 190. (Former course Biochemistry and Biophysics 190.) (P/NP grading only.)

140L. Cell Biology Laboratory (3) II. Baskin

Lecture—1 hour; laboratory—6 hours. Prerequisite: Biological Sciences 103, 104; course 141 recommended. Exercises illustrating the principles of cell biology, emphasis on individual research employing one or more advanced techniques. Not open to students who have received credit for Zoology 121L. (Former course Zoology 121L.)

141. Cellular Regulation of Gene Expression (4) III. Natzle

Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 101 and 102; Biological Sciences 104 recommended. Molecular and cellular mechanisms for regulating the flow of information from genome to the cytoplasm, and from one generation to the next in eukaryotes and prokaryotes. Various levels of regulation will be discussed from an experiment-based perspective. Not open to students who have received credit for Zoology 121B. (Former course Zoology 121B.)

142. Advanced Cell Biology: Contractile and Motile Systems (4) III. Baskin

Lecture—3 hours; term paper. Prerequisite: Biological Science 104; Mathematics 16B. Advanced cell bio-

Biological Sciences: Molecular and Cellular Biology

Carl W. Schmid, Ph.D., Chairperson of the Section
Section Office, 149 Briggs Hall (916-752-3611)

Faculty**Primary Section Members**

Peter B. Armstrong, Ph.D., Professor
Ronald J. Baskin, Ph.D., Professor
Kenneth C. Burtis, Ph.D., Associate Professor
Judy Callis, Ph.D., Associate Professor
Don M. Carlson, Ph.D., Professor
Wallis H. Clark, Jr., Ph.D., Professor (*Animal Science*)
James S. Clegg, Ph.D., Professor
Richard S. Criddle, Ph.D., Professor
John H. Crowe, Ph.D., Professor
Michael E. Dahmus, Ph.D., Professor
David W. Deamer, Ph.D., Professor
Roy H. Doi, Ph.D., Professor

ogy with emphasis on molecular, biophysical and cellular properties of contractile and motile systems. Not open to students who have received credit for Zoology 121C. (Former course Zoology 121C.)

***146. Histology (4) II.** The Staff

Lecture—3 hours; laboratory—2 hours. Prerequisite: Biological Science 104. Functional morphology of animal tissues and organs. Emphasis is placed on the use of structural studies in elucidating mechanisms underlying physiological and metabolic processes. Not open to students who have received credit for Zoology 122. (Former course Zoology 122.)

***148. Undergraduate Seminar in Cell Biology (2) I, II, III.** The Staff

Seminar—2 hours. Prerequisite: upper division standing in the biological sciences or a related discipline. Student reports on current topics in cell biology with emphasis on integration of concepts, synthesis, and state-of-the-art research approaches. Reviews of literature and reports of undergraduate research may be included. May be repeated for credit. (P/NP grading only.)

150. Embryology (4) I. Armstrong, Edwards; II. Grey and staff; III. Erickson

Lecture—4 hours. Prerequisite: Biological Sciences 1A-1B, and concurrent enrollment in course 150L. The events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation and organogenesis, with emphasis on vertebrates. Not open to students who have received credit for Zoology 100. (Former course Zoology 100.)

150L. Laboratory in Vertebrate Embryology (1) I. Armstrong, Edwards; II. Grey and staff; III. Erickson

Laboratory—3 hours. Prerequisite: concurrent enrollment in course 150. The comparative analysis of the embryonic development of vertebrates. Not open to students who have received credit for Zoology 100L. (Former course Zoology 100L.) (P/NP grading only.)

151. Advanced Developmental Biology (4) II.

Erickson, Natzle, Jeffery, Nuccitelli
Lecture—2 hours; laboratory—6 hours; written report. Prerequisite: courses 150, 150L; Biological Sciences 103. Lectures in modern topics in developmental biology will be followed by sophisticated laboratory exercises that demonstrate lecture topics. Students conduct their own independent studies during last four weeks of quarter; written report due at end of the quarter. Not open to students who have received credit for Zoology 101. (Former course Zoology 101.)

***158. Undergraduate Seminar in Developmental Biology (2) I, II, III.** The Staff

Seminar—2 hours. Prerequisite: upper division standing in the biological sciences or a related discipline. Student reports on current topics in developmental biology with emphasis on integration of concepts, synthesis, and state-of-the-art research approaches. Reviews of literature and reports of undergraduate research may be included. May be repeated for credit. (P/NP grading only.)

***159. Senior Colloquium in Developmental Biology (3) II.** Grey

Lecture—1 hour; seminar—2 hours. Prerequisite: course 150 with a grade of B or better; consent of instructor. Analysis of major topics in developmental biology, including fertilization and activation of development, morphogenesis, cell differentiation, and pattern formation. Limited enrollment. Not open to students who have received credit for Zoology 102. (Former course Zoology 102.)

160L. Principles of Genetics Laboratory (4) I, II.

Kiger, Burtis
Laboratory—6 hours; lecture—1 hour; laboratory/discussions—1 hour. Prerequisite: Biological Sciences 101. Laboratory work in basic and molecular genetics including gene mapping and isolation of mutants. Not open to students who have received credit for Genetics 100L. (Former course Genetics 100L.)

161. Molecular Genetics (3) I. Shen

Lecture—3 hours. Prerequisite: Biological Sciences 103. Molecular genetics including DNA structure and replication, restriction analysis, sequencing, transcription, translation and gene regulation. Not open to

students who have received credit for Genetics 102A and 102B. (Former courses Genetics 102A and 102B.)

162. Human Genetics (3) III. Sanders

Lecture—3 hours. Prerequisite: Biological Sciences 101 or the equivalent. Human molecular genetic variation, molecular basis of metabolic disorders, chromosome aberrations and consequences, diseases associated with the immune system, and statistical techniques for estimating genetic and environmental effects. Not open to students who have received credit for Genetics 107. (Former course Genetics 107.)

163. Developmental Genetics (3) II. Burtis

Lecture—3 hours. Prerequisite: Biological Sciences 101; Biological Sciences 102 and course 150 recommended. Current aspects of developmental genetics. Historical background and current genetic approaches to the study of development of higher animals. Not open to students who have received credit for Genetics 104. (Former course Genetics 104.)

164. Chromosome Structure and Function (3) I.

Hawley
Lecture—3 hours. Prerequisite: Biological Sciences 101; course 161. Intensive survey of chromosome structure and function. The primary emphasis will be on the structure and function of chromosomal organelles and their role in cell division and gene expression.

***166. Advanced Developmental Genetics (3) III.**

Kiger
Lecture—2 hours; discussion—1 hour. Prerequisite: courses 161, 163. Topics of current interest in the area of genetic control of development. Focus on the genetic dissection of development in *Drosophila* and *Caenorhabditis* with emphasis on transgenic and other novel techniques for the description and manipulation of developmental processes. Not open to students who have received credit for Genetics 144. (Former course Genetics 144.) (P/NP grading only.)

170L. Advanced Molecular Genetics Laboratory (6) II. Learned; III. Morin

Laboratory—9 hours; lecture—1 hour; discussion—2 hours. Prerequisite: Biological Sciences 101; course 120L, 160L; course 121, 141, or 161; and consent of instructor; Microbiology 102L recommended. Molecular analysis of gene structure and function. Isolation, manipulation, and characterization of DNA, RNA, and proteins using recombinant DNA technology. Limited enrollment. Not open for credit to students who have completed Genetics 102L. (Former course Genetics 102L.)

176. Undergraduate Seminar in Molecular Genetics (1) I. Hawley; II. Hawley, Schmid; III.

Hawley
Seminar—1 hour. Prerequisite: upper division standing, completion of Biological Sciences 101, course 160L, and completion or concurrent enrollment in course 161. Discussion of current topics in molecular genetics to show advanced applications of basic principles and to highlight professional career opportunities. May be repeated for credit. (Former course Genetics 191.) (P/NP grading only.)

190C. Undergraduate Research Conference (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: upper division standing and consent of instructor; and concurrent enrollment in course 193 or 199. Presentation and discussion of current research by faculty and students. May be repeated for credit. (Former course Genetics 190C.) (P/NP grading only.)

191. Introduction to Research (1) I, II. Segel

Seminar—1 hour. Prerequisite: consent of instructor. Various topics in molecular and cellular biology including biochemistry, genetics, and cell biology will be discussed, along with ways undergraduates can participate in research projects of faculty members. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff

Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Technical and/or practical experience on and off campus, supervised by a member of the Section of Molecular and Cellular Biology faculty. (Former courses Biochemistry and Biophysics 192, Genetics 192.) (P/NP grading only.)

193. Advanced Research (3) I, II, III. The Staff
Laboratory—6 hours; discussion—1 hour. Prerequisite: upper division standing, completion of an upper division Molecular and Cellular Biology laboratory course and consent of instructor. Research project carried out under the supervision of a faculty sponsor. Discussion and analysis of results and proposed experiments on a weekly basis with faculty sponsor. May include presentation of a seminar to a research group. May be repeated for credit. (Former course Genetics 193.) (P/NP grading only.)

194H. Research Honors (3) I, II, III. The Staff

Independent study—9 hours. Prerequisite: 6 units of course 193 and/or 199 with faculty director; senior standing; grade point average of at least 3.25; and consent of Section. Honors project. Continuation of an intensive, individual laboratory research project in biochemistry, genetics, or cell biology culminating with the presentation of the work in a written thesis and in a seminar. (Former course Biochemistry and Biophysics 194H.) (P/NP grading only.)

197T. Tutoring (1-5) I, II, III. The Staff

Tutoring—1-5 hours. Prerequisite: upper division standing, completion of course to be tutored, and consent of instructor. To assist the instructor by tutoring students in one of the Section's regular courses. (Former courses Biochemistry and Biophysics 197T, Genetics 197T.) (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff
Variable—1-5 hours. Prerequisite: consent of instructor. (Former courses Biochemistry and Biophysics 198, Genetics 198.) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff

Independent study—3-15 hours. Prerequisite: consent of instructor. (Former courses Biochemistry and Biophysics 199, Genetics 199.) (P/NP grading only.)

Graduate Courses

200A. Current Techniques in Cell Biology (2) I.

The Staff
Lecture—2 hours. Prerequisite: graduate standing; Biological Sciences 104 and course 141 or the equivalent courses. Current techniques used in cell biology research including microscopy, spectroscopy, electrophysiology, immunochemistry, histology, organelle isolation, calorimetry, tissue culture and gel electrophoresis. Lectures are presented by experts on each technique, with an emphasis on pitfalls to avoid when using the technique. (Same course as Cell and Developmental Biology 200.) Not open to students who have received credit for Zoology 200. (Former course Zoology 200.) (S/U grading only.)

200B. Current Techniques in Biochemistry (2) II.

Hedrick
Lecture—2 hours. Prerequisite: Biological Sciences 103 and course 120L or the equivalent courses. Current techniques used in biochemical research including protein and carbohydrate analyses, immunochemistry, recombinant DNA methods, electrophoretic and chromatographic methods. Not open to students who have received credit for Biochemistry and Biophysics 200. (Former course Biochemistry and Biophysics 200.)

200C. Current Techniques in Biophysics (2) III.

The Staff
Lecture—2 hours. Prerequisite: graduate standing; Biological Sciences 102 or 104 or the equivalent. Current techniques in biophysics research including diffraction, magnetic resonance spectroscopy, calorimetry, optical spectroscopy, and electrophysiology. (Same course as Biophysics Graduate Group 200.) (S/U grading only.)

220L. Advanced Biochemistry Laboratory Rotations (5) I, II, III. Hedrick

Laboratory—15 hours. Prerequisite: course 221A (may be taken concurrently), and 120L or the equivalent. Two five-week assignments in biochemistry research laboratories. Individual research problems with emphasis on methodological/procedural experience and experimental design. May be repeated twice for credit. (Former course Biochemistry and Biophysics 202L.)

221A. Physical and Chemical Biochemistry (4) I. Benisek (Biological Chemistry), Schmid, Segel
Lecture—4 hours. Prerequisite: Biological Sciences 103; Chemistry 107B-108 or 110C; 128C-129C or 118C, or the equivalent courses. Biochemical thermodynamics and chemical and physical properties of biomacromolecules, including enzyme kinetics and methods for determining size and shape of macromolecules. Not open to students who have received credit for Biochemistry and Biophysics 201A. (Former course Biochemistry and Biophysics 201A.)

221B. Integration of Metabolism and Regulatory Phenomena (3) I. Learned, Segel
Lecture—3 hours. Prerequisite: course 221A or consent of instructor. Regulatory phenomena that occur in control of metabolism; e.g., regulation at enzyme level; integration of metabolic pathways including homeostasis, hormonal influences, turnover of enzymes, comparative aspects of metabolism, regulation of amino acids and lipid metabolism in living systems. Not open to students who have received credit for Biochemistry and Biophysics 201B. (Former course Biochemistry and Biophysics 201B.)

221C. Molecular Biology (4) III. The Staff
Lecture—4 hours. Prerequisite: course 221A. Structure and organization of DNA and chromatin; DNA replication, repair and modification; transcription and RNA processing; protein biosynthesis and turnover; transcriptional and post-transcriptional control mechanisms; examples of the above from eukaryotic and prokaryotic cells, and viruses. Not open to students who have received credit for Biochemistry and Biophysics 201C. (Former course Biochemistry and Biophysics 201C.)

221D. Cellular Biochemistry (3) II. Etzler, Hanley (Biological Chemistry), NcNamee, Scholey
Lecture—3 hours. Prerequisite: course 221A. Structure and function of cell membranes and cell surface components with emphasis on biochemical principles involved in cell growth, cell development and cell-cell interactions. Biochemical aspects of some differentiated systems, such as the immune system. Not open to students who have received credit for Biochemistry and Biophysics 201D. (Former course Biochemistry and Biophysics 201D.)

231. Membrane Biochemistry (2) III. NcNamee
Lecture—2 hours. Prerequisite: course 221D. Advanced topics in membrane biochemistry with emphasis on the structure and function of membrane proteins and lipids. Offered in alternate years. Not open to students who have received credit for Biochemistry and Biophysics 208. (Former course Biochemistry and Biophysics 208.)

***232. Chemical Modifications of Proteins** (3) III. Benisek (Biological Chemistry)
Lecture—3 hours. Prerequisite: Biological Sciences 103; Chemistry 128C or 118C or the equivalent courses. Chemical approaches for studying proteins, emphasizing the use of chemical modifications as a tool in the study of active sites, particularly of enzymes, and relating the structure of proteins to their functions. Offered in alternate years. Not open to students who have received credit for Biochemistry and Biophysics 212. (Former course Biochemistry and Biophysics 212.)

***241. Membrane Biology** (3) I. Deamer
Lecture—3 hours. Prerequisite: Biological Sciences 102 and 103, or Biological Sciences 104 and course 141, or consent of instructor. This course will emphasize biological aspects of membrane function and structure. The general approach will be to discuss cell biology from the viewpoint of membranous components of cells. Offered in alternate years. Not open to students who have received credit for Zoology 241. (Former course Zoology 241.)

***242. Muscle Biophysics** (4) I. Baskin
Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: Biological Sciences 102, 103 and Mathematics 16B or 21B; or consent of instructor. The physical and chemical aspects of muscle function. Not open to students who have received credit for Zoology 236. (Former course Zoology 236.)

248. Seminar in Cell Biology (2) III. Scholey
Seminar—2 hours. Prerequisite: consent of instructor. Discussion of recent literature on the physical and chemical aspects of organization and function of living systems, topics of current interest in ultrastructure and function of cells. Organizational and functional properties of the molecular and cellular levels of biological systems. May be repeated for credit. (Former course Zoology 266.)

***249. Literature in Cell Biology** (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. Presentation and critique of recent journal articles in cell biology. General topic area will change each quarter. May be repeated for credit. (Former course Zoology 242.) (S/U grading only.)

***250. Special Topics in Cell Biology** (3) I. Deamer
Lecture—2 hours; Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Discussion and review of current topics in cell biology. May be repeated for credit. (Former course Zoology 240.)

***251. Biology of Fertilization** (3) I. Nuccitelli, Meizel, Clark, Hedrick
Lecture—2 hours; term paper. Prerequisite: Biological Sciences 104 or the equivalent, and consent of instructor. The morphology, physiology, and biochemistry of gametes, and the mechanism and consequences of their union. Offered in alternate years. Not open to students who have received credit for Zoology 225. (Former course Zoology 225.)

***252. Cellular Basis of Morphogenesis** (4) III. Armstrong
Lecture/discussion—3 hours; term paper. Prerequisite: course 150. Development of form and structure; morphogenetic movement, mechanisms of cellular motility, cell adhesion, intercellular invasion, interaction of cells and tissues in development. Offered in alternate years. Not open to students who have received credit for Zoology 204. (Former course Zoology 204.)

***253. Pattern Formation** (4) II. Nuccitelli
Lecture—3 hours; term paper. Prerequisite: course 150, Biological Sciences 104 or the equivalent, and consent of instructor. Morphology and mechanism of pattern formation beginning with ooplasmic segregation. Emphasis will be on cell polarity, but some multicellular systems will also be covered. Offered in alternate years. Not open to students who have received credit for Zoology 205. (Former course Zoology 205.)

***254. Mechanisms of Organogenesis** (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: course 150. This course will demonstrate the various means by which several cell types become organized and differentiate to form a functional unit, using five selected organ systems. Offered in alternate years. Not open to students who have received credit for Zoology 206. (Former course Zoology 206.)

***255. Molecular Mechanisms in Animal Development** (3) I. Natzle, Jeffery
Lecture—1.5 hours; seminar—1.5 hours. Prerequisite: graduate standing or consent of instructor; introductory background in development biology and molecular genetics recommended. Analysis of the molecular mechanisms that control animal development, with a special focus on multiple levels of gene regulation. Experimental systems including *Drosophila*, amphibians, *C. elegans*, and mice will be discussed. Readings will be taken from current literature. Offered in alternate years. Not open to students who have received credit for Zoology 208. (Former course Zoology 208.)

256. Cell and Molecular Biology of Cancer (1) I. Armstrong
Lecture—1 hour. Prerequisite: course 150 or 141 or Biological Sciences 104 or Biological Sciences 102 and 103. Analysis at the cellular and molecular levels of the regulation of normal and neoplastic growth, tumor dissemination, identification and characterization of oncogenic agents, characterization of oncogenes and anti-oncogenes. Not open to students who

have received credit for Zoology 226. (Former course Zoology 226.)

258. Seminar in Development (2) II. Armstrong, Erickson
Seminar—2 hours. Prerequisite: consent of instructor. Reports and discussion on embryology, morphogenesis, and developmental mechanisms. May be repeated for credit. (Former course Zoology 292.)

259. Literature in Developmental Biology (1) I, II, III. Erickson
Seminar—1 hour. Prerequisite: consent of instructor. Critical presentation and analysis of recent journal articles in developmental biology. May be repeated for credit. (Former course Zoology 269.) (S/U grading only.)

***262. Recombinant DNA and Genetic Engineering** (3) II. Rodriguez
Lecture—3 hours. Prerequisite: course 161 or Microbiology 130A-130B or consent of instructor. This course will explore the biology of necessary elements such as plasmids, transposons insertion sequences, prophages, etc. Both prokaryotic and eukaryotic moveable genetic elements will be discussed. The molecular biology of plasmid replication, illegitimate recombination, etc., will be considered. Offered in alternate years. Not open to students who have received credit for Genetics 202. (Former course Genetics 202.) (S/U grading only.)

290C. Research Conference (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Presentations and critical discussions of faculty and graduate student research in molecular and cellular biology including biochemistry, genetics, and cell biology. May be repeated for credit. (Former courses Biochemistry and Biophysics 250, Genetics 290C.) (S/U grading only.)

291. Current Progress in Molecular and Cellular Biology (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: graduate standing or consent of instructor. Seminars presented by guest lecturers on subject of their own research activities. May be repeated for credit. (Former course Biochemistry and Biophysics 291.) (S/U grading only.)

295. Literature in Molecular and Cellular Biology (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Critical reading and evaluation of current literature in molecular and cellular biology disciplines. Papers will be presented and discussed in detail. May be repeated for credit. (S/U grading only.)

296. Research Seminar (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: course 221C or consent of instructor. Presentation and critical discussions of research activities of various members of the local molecular and cellular biology community; primarily designed for graduate students. May be repeated for credit. (Former course Biochemistry and Biophysics 270.) (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
Variable—1-5 hours. Prerequisite: consent of instructor. (Former courses Biochemistry and Biophysics 298, Genetics 298.) (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
Independent study—3-36 hours. (Former courses Biochemistry and Biophysics 299, Genetics 299.) (S/U grading only.)

Professional Course

390. Methods of Teaching (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Practical experience in the methods and problems of teaching biochemistry/genetics/cell biology. Includes analysis of texts and supporting material, discussion of teaching techniques, preparing for and conducting discussion and laboratory sections, formulating examinations under supervision of instructor. Participating in the teaching program required for Ph.D. May be repeated for credit. (Former courses Biochemistry and Biophysics 390, Genetics 300.) (S/U grading only.)

Biological Sciences: Neurobiology, Physiology, and Behavior

Barbara A. Horwitz, Ph.D., Chairperson of the Section

Section Office, 196 Briggs Hall (916-752-0203)

Faculty

Primary Section Members

Marylynn S. Barkley, Ph.D., Associate Professor
Kenneth H. Britten, Ph.D., Assistant Professor
Earl E. Carstens, Ph.D., Professor
Leo M. Chalupa, Ph.D., Professor
Ernest S. Chang, Ph.D., Professor (*Animal Science*)
Charles A. Fuller, Ph.D., Professor
Jack M. Goldberg, Ph.D., Lecturer
Charles M. Gray, Ph.D., Assistant Professor
John M. Horowitz, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*
Barbara A. Horwitz, Ph.D., Professor, *Academic Senate Distinguished Teaching Award, UC Davis Prize for Teaching and Scholarly Achievement*

Andrew T. Ishida, Ph.D., Associate Professor
Patricia Johnson, Ph.D., Adjunct Professor (*Nutrition*)
Joel E. Keizer, Ph.D., Professor
Peter R. Marler, Ph.D., Professor
Gary P. Moberg, Ph.D., Professor (*Animal Science*)
Brian Mulloney, Ph.D., Professor
Pamela A. Pappone, Ph.D., Associate Professor
Gregg H. Recanzone, Ph.D., Assistant Professor
Grace L. Rosenquist, Ph.D., Assistant Adjunct Professor
Arnold J. Sillman, Ph.D., Professor
Mitchell L. Sutter, Ph.D., Assistant Professor
W. Jeff Weidner, Ph.D., Professor
Martin Wilson, Ph.D., Professor
Charles M. Winget, Ph.D., Lecturer
Dorothy E. Woolley, Ph.D., Professor

Secondary Section Members

Ronald J. Baskin, Ph.D., Professor
John H. Crowe, Ph.D., Professor
Marc Mangel, Ph.D., Professor
Mark G. McNamee, Ph.D., Professor
Judy A. Stamps, Ph.D., Professor

Emeriti Faculty

James M. Boda, Ph.D., Professor Emeritus
Harry W. Colvin, Ph.D., Professor Emeritus
Frederick W. Lorenz, Ph.D., Professor Emeritus
Verne E. Mendel, Ph.D., Professor Emeritus
Arthur H. Smith, Ph.D., Professor Emeritus

Courses in Neurobiology, Physiology and Behavior (NPB)

Lower Division Course

10. Elementary Physiology (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Introductory course in physiology for nonscience majors. Not open for credit to students who have had Biological Sciences 1B.

Upper Division Courses

101. Systemic Physiology (5) I, II, III. Barkley, Fuller, Ishida, Goldberg, Sillman, Weidner
Lecture—5 hours. Prerequisite: Biological Sciences 1B; Physics 1B or 5C strongly recommended. Systemic physiology with emphasis on aspects of human physiology. Functions of major organ systems, with the structure of those systems described as a basis for understanding the functions. Not open for credit to students who have completed Physiology 110 or Neurobiology, Physiology and Behavior 110. (Former course 110, Physiology 110.)

101L. Systemic Physiology Laboratory

 (2) I.

Adamson; III. Ishida

Laboratory—3 hours; discussion—1 hour. Prerequisite: course 101 prior to taking 101L recommended, but 101 may be taken concurrently. Selected experiments to illustrate functional characteristics of organ systems discussed in course 101. Not open for credit to students who have completed Physiology 110L or Neurobiology, Physiology and Behavior 110L. (Former courses 110L, Physiology 110L.)

102. Animal Behavior

 (3) II. Marler, Stamps

Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Basic principles of behavioral organization in vertebrate and invertebrate animals. Underlying physiological and ethological mechanisms. The evolution of behavior, with special emphasis on behavior under natural conditions. Not open to students who have received credit for Neurobiology, Physiology and Behavior 155 or Zoology 155. (Former courses Neurobiology, Physiology and Behavior 155, Zoology 155.)

103. Cellular Physiology/Neurobiology

 (3) II.

Pappone

Lecture—3 hours. Prerequisite: Biological Sciences 103 and 104; Physics 5C recommended. Cellular physiology with emphasis on membrane transport processes and neuronal physiology. Fundamental physical-chemical and biological mechanisms of membrane transport will be considered in relation to cytoplasmic homeostasis, communication between cells, and the cellular mechanisms of sensory and motor transduction. Not open to students who have received credit for Neurobiology, Physiology and Behavior 100B or Physiology 100B. (Former courses Neurobiology, Physiology and Behavior 100B, Physiology 100B.)

104L. Cellular Physiology/Neurobiology Laboratory

 (3) II. Horwitz

Laboratory—3 hours; lecture—1 hour; discussion—1 hour. Prerequisite: Biological Sciences 104 or the equivalent; and course 103 (may be taken concurrently). Experiments in the physical and chemical processes of cells and tissues. Not open to students who have received credit for Neurobiology, Physiology and Behavior 100L or Physiology 100L. (Former course 100L, Physiology 100L.)

106. Experiments in Physiology: Design and Execution

 (3) I, II, III. The Staff

Laboratory—7-9 hours; discussion—0.5 hours. Prerequisite: course 101 and consent of instructor. Experiments in current physiological problems. Discussion of experimental design. Students choose a project, and independently or in groups of 2-3, design a protocol, do the project, and report their findings. May be repeated for credit with consent of instructor. (Former course Physiology 106.) (P/NP grading only.)

111A. Advanced Systemic Physiology Laboratory

 (3) I. Adamson

Lecture—1 hour; discussion—five 2-hour sessions to alternate weekly with laboratory—five 6-hour sessions. Prerequisite: courses 101, 101L; courses 113, 114 recommended. Selected comprehensive experiments on the cardiovascular, respiratory, digestive, and endocrine systems. Emphasis on conceptual and methodological approaches using several species in demonstrating the physiology of organ systems. Not open for credit to students who have completed Physiology 111A. (Former course Physiology 111A.)

111B. Advanced Systemic Physiology Laboratory

 (3) II. Adamson

Lecture—1 hour; discussion—five 2-hour sessions to alternate weekly with laboratory—five 6-hour sessions. Prerequisite: courses 101, 101L; course 112 recommended. Course 111A is not a prerequisite for course 111B. Selected comprehensive experiments on the nervous and muscular systems. Emphasis on conceptual and methodological approaches using several species in demonstrating the physiology of organ systems. Not open for credit to students who have completed Physiology 111B. (Former course Physiology 111B.)

111C. Advanced Systemic Physiology Laboratory

 (3) III. Adamson

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 101, 101L, Statistics 13; course 112, 113, or 114 recommended. Interfacing physiological recording equipment with microcomputers; data acquisition and analysis using the microcomputer; data interpretation within the framework of physiological concepts. Not open for credit to students who have completed Physiology 111C. (Former course Physiology 111C.)

112. Neuroscience

 (3) I, II. Carstens, Gray, Britten

Lecture—3 hours. Prerequisite: course 101. Presentation of concept in neuroscience including sensory systems, motor systems, and higher neural integration. Emphasis on mammalian nervous system. Not open for credit to students who have completed Physiology 112. (Former course Physiology 112.)

113. Cardiovascular, Respiratory, and Renal Physiology

 (4) II. Goldberg, Weidner

Lecture—4 hours. Prerequisite: course 101; Chemistry 8B, Physics 5B recommended. An intense and advanced presentation of concepts in cardiovascular, respiratory, and renal physiology including discussion of acid-base balance. Recommended for Physiology students, graduate students, and others in allied interests. Not open for credit to students who have completed Physiology 113. (Former course Physiology 113.)

114. Gastrointestinal Physiology

 (3) III. Johnson

Lecture—3 hours; term paper. Prerequisite: course 101; Biological Sciences 103 recommended. Advanced gastrointestinal physiology covering absorption, secretion, motility, and special emphasis on endocrinology and innervation. Emphasis will be on physiology of the gastrointestinal tract; some pathology and nutritional items will be covered. Not open for credit to students who have completed Physiology 114. (Former course Physiology 114.)

*117. Avian Physiology

 (3) III. The Staff

Lecture—3 hours. Prerequisite: course 101 or Biological Sciences 1B. Physiology of the various systems of birds with emphasis on digestion, respiration, excretion, and endocrine systems. Not open for credit to students who have completed Physiology 117. (Former course Physiology 117.)

119. Invertebrate Physiology

 (4) II. Crowe

Lecture—3 hours; term paper; individual conferences. Prerequisite: Evolution and Ecology 112, Chemistry 2A, 2B, Physics 5C; Biological Sciences 102 and 103 recommended. Comparative physiology of invertebrate organ systems. Not open for credit to students who have completed Neurobiology, Physiology and Behavior 142 or Zoology 142. (Former courses 142, Zoology 142.)

119L. Invertebrate Physiology Laboratory

 (3) II.

Crowe

Laboratory—6 hours (includes research project). Prerequisite: course 119 (may be taken concurrently). Experiments on the physiological mechanisms of invertebrate organ systems. Design and execution of a research project. Not open for credit to students who have completed Neurobiology, Physiology and Behavior 142L or Zoology 142L. (Former courses 142L, Zoology 142L.)

121. Physiology of Reproduction

 (3) II. Anderson

Lecture—3 hours. Prerequisite: course 101. Physiological mechanisms related to reproduction, breeding efficiency, and fertility, with special reference to domestic animals. Not open for credit to students who have completed Physiology 121. (Former course Physiology 121.)

121L. Physiology of Reproduction Laboratory

 (1)

II. Anderson

Laboratory—3 hours. Prerequisite: course 121 recommended (may be taken concurrently). Experiments on the reproductive systems of domestic animals including male and female gametes. Not open for credit to students who have completed Physiology 121L. (Former course Physiology 121L.) (P/NP grading only.)

125. Comparative Physiology: Neurointegrative Mechanisms

 (3) III. Woolley

Lecture—3 hours. Prerequisite: course 101. Comparisons of physiological functions in the animal king-

dom: neurointegrative mechanisms of integration including aspects of phylogenetic development at both neuronal and systemic levels. Not open for credit to students who have completed Neurobiology, Physiology and Behavior 120A or Physiology 120A. (Former courses 120A, Physiology 120A.)

126. Comparative Physiology of Sensory Systems (3) II. Sillman

Lecture—3 hours. Prerequisite: course 101. Basic physiological mechanisms involved in sensory systems. Comparative approach to considerations of mechano-sensitive systems (audition, lateral lines, touch, echo location, equilibrium), chemosensitive systems (olfaction, taste, pheromones), photosensitive systems (vision, infrared detection, UV detection), electroreception, and pain. Emphasis on receptors. Not open for credit to students who have completed Neurobiology, Physiology and Behavior 120F or Physiology 120F. (Former courses 120F, Physiology 120F.)

127. Comparative Physiology: Circulation (3) III. Goldberg

Lecture—3 hours. Prerequisite: course 101. Comparisons of physiological functions in the animal kingdom: circulation. Comparative approach to cardiovascular function in vertebrates and invertebrates. Not open for credit to students who have completed Neurobiology, Physiology and Behavior 120B or Physiology 120B. (Former courses 120B, Physiology 120B.)

128. Comparative Physiology: Endocrinology (3) II. Barkley

Lecture—3 hours. Prerequisite: course 101. Comparison of physiological functions in the animal kingdom: animal hormones and their functions. Not open for credit to students who have completed Neurobiology, Physiology and Behavior 120D or Physiology 120D. (Former courses 120D, Physiology 120D.)

***129. Comparative Physiology: Respiration** (3) II. Cech

Lecture—3 hours. Prerequisite: course 101. Comparisons of physiological functions in the animal kingdom: respiration. Offered in alternate years. Not open for credit to students who have completed Neurobiology, Physiology and Behavior 120E or Physiology 120E. (Former courses 120E, Physiology 120E.)

130. Physiology of the Endocrine Glands (4) I. Adams

Lecture—4 hours. Prerequisite: course 101. Advanced presentation of concepts in endocrinology with emphasis on the role of hormones in reproduction, metabolism, and disease. Not open for credit to students who have completed Physiology 130. (Former course Physiology 130.)

140. Principles of Environmental Physiology (3) II. Fuller

Lecture—3 hours. Prerequisite: course 101 and Biological Sciences 104, or Biological Sciences 102 or the equivalent. Physiological aspects of interactions of organisms and environment at cellular, system, and organismal levels. Emphasis on regulatory responses/mechanisms to thermal, pressure and osmotic environmental variables. Not open for credit to students who have completed Neurobiology, Physiology and Behavior 148 or Physiology 148. (Former courses 148, Physiology 148.)

141. Physiological Adaptation of Marine Organisms (4) III. Clegg (Molecular and Cellular Biology), Chang

Lecture—30 hours total; laboratory—30 hours total. Prerequisite: Biological Sciences 102 and 103; Biological Sciences 123 (concurrently); Physics 5A-5B-5C. Physiological adaptation to the environment among organisms in marine and estuarine habitats. Course offered at Bodega Marine Laboratory. (See "Division-wide Programs" for Bodega Marine Laboratory Program.) Not open for credit to students who have completed Biological Sciences 121. (Former course Biological Sciences 121.)

141P. Physiological Adaptation of Marine Organisms/Advanced Laboratory Topics (6) III. Clegg (Molecular and Cellular Biology), Chang
Laboratory—150 hours total; discussion—10 hours total. Prerequisite: course 141 concurrently. Students pick a research topic for intense study. Research will

be related to a topic covered in course 141 and will be conducted at the Bodega Marine Laboratory with close supervision of resident faculty. (See "Division-wide Programs" for Bodega Marine Laboratory Program.) Not open for credit to students who have completed Biological Sciences 121P. (Former course Biological Sciences 121P.)

150. Hormones and Behavior (3) III. Mendoza

Lecture—3 hours. Prerequisite: courses 101, 102. Endocrine physiology with emphasis on the principles of behavior. Fundamental relationships between hormones and various behaviors engaged in by the individual during its lifetime. Role of hormones in behavioral homeostasis, social behavior, reproductive behavior, parental behavior, adaptation to stress.

160. Advanced Cellular Neurobiology (4) I. Mulloney and Wilson

Lecture—3 hours; independent study—1 hour; extensive outside reading; writing of take-home essays. Prerequisite: course 103, Biological Sciences 101, 102, 104, or consent of instructor; Physics 5C recommended. A consideration of neuronal structure; ion channels; synapses, transmitters and transmitter pharmacology; receptors; neuronal modulation and circuit dynamics. Not open to students who have received credit for Neurobiology, Physiology and Behavior 143 or Zoology 143. (Former courses 143, Zoology 143.)

160L. Advanced Cellular Neurobiology Laboratory (4) II. Mulloney

Laboratory—12 hours. Prerequisite: course 160, Physics 5C recommended. Students will learn to record neural activity, interpret their recordings, and to label neurons with antibodies against neurotransmitters. Not open to students who have received credit for course Neurobiology, Physiology & Behavior 143L or Zoology 143L. (Former courses 143L and Zoology 143L.)

161. Developmental Neurobiology (3) III. Chalupa
Lecture—3 hours. Prerequisite: courses 101 and 103. Issues, theoretical concepts, and methodologies in developmental neurobiology. Topics include prenatal and postnatal differentiation of neurons, and plasticity in the mature and aging brain. Integration of neurochemical, structural, physiological and behavioral perspectives.

162. Neural Basis of Behavior: Neuroethology (3) III. Mulloney

Lecture—3 hours. Prerequisite: courses 102, 103. Analysis of the mechanisms by which cellular properties of neurons determine the characteristics of neural circuits and behaviors, including locomotion, visually and acoustically guided hunting, startle-responses, communication, and learning

190. Proseminar in Physiology (3) I, II, III. The Staff (Chairperson in charge)

Seminar—3 hours. Prerequisite: course 101 and Biological Sciences 104 (or Physiology 100A), one additional upper division course in physiology or a related course in science, and consent of instructor. Student presentations, discussion, and critical evaluation of material in important areas of physiology. Topics may vary from year to year. Limited enrollment.

190C. Introduction to Physiological Research (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: upper division standing in physiology or related biological science; consent of instructor. Introduction to research findings and methods in physiology. Presentation and discussion of research by faculty and students. May be repeated for credit. (Former course Physiology 190C.) (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in all subject areas offered in physiology. (Former course Physiology 192.) (P/NP grading only.)

194HA-194HB-194HC. Physiology—Honors

(1, 1-4, 2) I, II, III. The Staff
Laboratory—3-12 hours. Prerequisite: senior standing; minimum 3.5 GPA; approval by the section's Honors Committee. Honors project in physiology. Laboratory research in physiology on a specific question. Project developed with a sponsoring faculty member (Physiology Graduate Group member) and approved by the section's Honors Committee. Honors thesis submitted upon completion of the project. Not open for credit to students who have completed Physiology 194HA-194HB-194HC. (Former course Physiology 194HA-194HB-194HC.) (P/NP grading only.)

***196A. Voluntary Control of Physiological Processes** (2) I, II, III. Lorenz

Seminar—1 hour; laboratory—3 hours. Prerequisite: adequate upper division preparation in at least one of the following: physiology, behavioral science, computer science, physics or electrical engineering; consent of instructor. Individual or team projects in voluntary control of physiological processes emphasizing application of microcomputer-assisted biofeedback techniques. (Former course Physiology 196A.) (P/NP grading only.)

***196B. Voluntary Control of Physiological Processes** (1-4) I, II, III. Lorenz

Laboratory—3-12 hours. Prerequisite: course 196A. Individual or team projects in voluntary control of physiological processes emphasizing application of microcomputer-assisted biofeedback techniques. May be repeated for credit with a maximum of 6 units for 196A-196B course sequence. (Former course Physiology 196B.) (P/NP grading only.)

197T. Tutoring in Neurobiology, Physiology and Behavior (1-5) I, II, III. The Staff

Discussion—2-6 hours. Prerequisite: upper division standing and consent of instructor. Assisting in courses in neurobiology, physiology and behavior under the direction of the faculty. (Former course Physiology 197T.) (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(Former course Physiology 198.) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(Former course Physiology 199.) (P/NP grading only.)

Biological Sciences: Plant Biology

Robert W. Pearcy, Ph.D., Chairperson of the Section
Section Office, 143 Robbins Hall (916-752-0617)

Committee in Charge

Kent J. Bradford, Ph.D. (*Vegetable Crops*)
John J. Harada, Ph.D. (*Plant Biology*), Chairperson
Terence M. Murphy, Ph.D. (*Plant Biology*)
Carolyn Napoli, Ph.D. (*Environmental Horticulture*)
Robert M. Thorton, Ph.D. (*Plant Biology*)
John Yoder, Ph.D. (*Vegetable Crops*)

Faculty

Faculty includes members of the Departments of Agronomy and Range Science; Environmental Horticulture; Land, Air and Water Resources; Plant Pathology; Pomology; Vegetable Crops; Viticulture and Enology; and the Sections of the Division of Biological Sciences.

Primary Section Members

David E. Bayer, Ph.D., Professor
Richard H. Falk, Ph.D., Professor
John J. Harada, Ph.D., Associate Professor
William J. Lucas, Ph.D., Professor
Terence M. Murphy, Ph.D., Professor
Robert F. Norris, Ph.D., Associate Professor
Sharman O'Neill, Ph.D., Assistant Professor
Robert W. Pearcy, Ph.D., Professor
Thomas L. Rost, Ph.D., Professor
Alan J. Stemler, Ph.D., Professor

Steven M. Theg, Ph.D., Assistant Professor
Robert M. Thornton, Ph.D., Senior Lecturer,
Academic Senate Distinguished Teaching Award

Larry N. Vanderhoef, Ph.D., Professor

Secondary Section Members

Judy Callis, Ph.D., Associate Professor
Richard S. Criddle, Ph.D., Professor
James A. Doyle, Ph.D., Professor (*Geology*)
Marilynn E. Etzler, Ph.D., Professor
Charles S. Gasser, Ph.D., Associate Professor
R. Marc Learned, Ph.D., Assistant Professor
Marcel Rejmanek, Ph.D., Associate Professor
Raymond L. Rodriguez, Ph.D., Professor
Irwin H. Segel, Ph.D., Professor
Maureen L. Stanton, Ph.D., Professor
Donald R. Strong, Ph.D., Professor

Emeriti Faculty

Fredrick T. Addicott, Ph.D., Professor Emeritus
Floyd M. Ashton, Ph.D., Professor Emeritus
Bruce A. Bonner, Ph.D., Professor Emeritus
Herbert B. Currier, Ph.D., Professor Emeritus
Emanuel Epstein, Ph.D., Professor Emeritus
Ernst M. Gifford, Ph.D., Professor Emeritus,
Academic Senate Distinguished Teaching Award
Hendrick J. Ketellapper, Ph.D., Professor Emeritus
Donald W. Kyhos, Ph.D., Professor Emeritus
Norma J. Lang, Ph.D., Professor Emeritus
C. Ralph Stocking, Ph.D., Professor Emeritus
John M. Tucker, Ph.D., Professor Emeritus
Grady Webster, Ph.D., Professor Emeritus
Kenneth Wells, Ph.D., Professor Emeritus

Courses in Plant Biology (PLB)

Lower Division Courses

10. Plants, People and the Biosphere (3) II. Falk
Lecture—3 hours; one weekend field trip (half-day); term paper. Ethnobotanical and ecological themes are emphasized in examining our dependence on plants, the ecological roles of plants, and the development of botany as a contemporary science. Non-science majors are encouraged to enroll. General Education credit: Nature and Environment. Not open for credit to students who have completed Botany 10. (Former course Botany 10.)

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: consent of instructor. Technical and/or professional experience on or off campus. Supervised by a member of the Plant Biology Department faculty. (Former course Botany 92.) (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Primarily for lower division students. (Former course Botany 98.) (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge.)
Prerequisite: consent of instructor. (Former course Botany 99.) (P/NP grading only.)

Upper Division Courses

102. California Floristics (5) III. The Staff
Lecture—2 hours; lecture/discussion—1 hour; laboratory—6 hours (includes three one-day, weekend field trips). Prerequisite: Biological Sciences 1A, 1B, 1C or the equivalent in plant science. Survey of the flora of California, with emphasis on field recognition and identification of important vascular plant families and genera characterizing the major floristic regions. Lectures review the taxonomic diversity, evolutionary relationships, and geographical patterns of California flora. Not open for credit to students who have completed Botany 102. (Former course Botany 102.)

105. Developmental Plant Anatomy (5) I. Rost
Lecture—3 hours; laboratory—6 hours. Prerequisite: introductory plant biology (for example, Biological Sciences 1C). Survey of vascular plant structure and development. Current ideas and experimental evidence for developmental concepts. Not open for

credit to students who have completed Botany 105. (Former course Botany 105.)

108. Systematic Botany of Flowering Plants (5) III. Doyle
Lecture—3 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Laboratory and field studies of the characters and relationships of the principal families and orders of flowering plants. Principles of taxonomy. Practice in identification of species by means of keys. Not open for credit to students who have completed Botany 108. (Former course Botany 108.)

111. Plant Physiology (3) I. Lucas
Lecture—3 hours. Prerequisite: Biological Sciences 1C; Chemistry 8B (may be taken concurrently; Physics 5A, 5B, 5C recommended). Fundamental activities of plants; the plant cell as a functioning unit. Processes of absorption, movement, and utilization of water and minerals. Water loss, translocation, photosynthesis, respiration. Not open for credit to students who have completed Botany 111. (Former course Botany 111.)

111D. Problems in Plant Physiology (1) I. Lucas
Discussion—1 hour. Prerequisite: course 111 concurrently. Discussion of problems and applications relating to principles presented in course 111. Students will be assigned problems each week showing novel applications of principles described in course 111 and will prepare answers to be delivered orally during the class period. Not open for credit to students who have completed Botany 111D. (Former course Botany 111D.) (P/NP grading only.)

111L. Introductory Plant Physiology Laboratory (3) III. Murphy
Discussion—1 hour; laboratory—6 hours. Prerequisite: course 111 (may be taken concurrently). Introduction to basic experimental techniques and instrumentation used in the investigation of plant physiological processes such as water-solute absorption and their movement and utilization; translocation; transpiration; photosynthesis; respiration; growth; development and reproduction. Not open for credit to students who have completed Botany 111L. (Former course Botany 111L.)

112. Plant Growth and Development (3) II. Thornton
Lecture—3 hours. Prerequisite: Biological Sciences 1C; Chemistry 8B; course 111 and Biological Sciences 102 recommended. Processes, dynamics, and control of growth and development. Metabolism. Not open for credit to students who have completed Botany 112. (Former course Botany 112.)

112D. Problems in Plant Growth and Development (1) II. Thornton
Discussion—1 hour. Prerequisite: course 112 concurrently. Discussion of problems and applications relating to principles presented in course 112. Students will be assigned problems each week showing novel applications of the principles described in course 112 and will prepare answers to be delivered orally during class period. Not open for credit to students who have completed Botany 112D. (Former course Botany 112D.) (P/NP grading only.)

116. Plant Development and Evolution (4) II. Jernstedt
Lecture—2 hours; laboratory—6 hours. Prerequisite: introductory plant biology (i.e., Biological Sciences 1C). Introduction to form, development and evolution of vascular plants. Emphasis is given to the development of reproductive structures in ferns and seed-producing plants as a basis for determining evolutionary relationships. Structure-function relationships are also considered with regard to changing environments. Not open for credit to students who have completed Botany 116. (Former course Botany 116.)

117. Plant Ecology (4) I. Pearcy
Lecture—3 hours; three to five field trips. Prerequisite: Biological Sciences 1A, 1B, 1C; course 112; course 102 or 108 strongly recommended. The study of interactions between plant populations or vegetation types and their environment. Special emphasis on California. Students taking course 117 cannot receive credit for course 101. (Same course as Evolution and Ecol-

ogy 117.) Not open for credit to students who have completed Botany 117. (Former course Botany 117.)

118. Introduction to Phycology (4) II. The Staff
Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Comparative morphology, physiology, development and reproduction of the major algal groups, including cyanobacteria. Focus is on phylogeny through serial endosymbioses. Laboratories study living organisms and have identification exercises. Ecological factors and commercial uses are considered. Not open for credit to students who have completed Botany 118. (Former course Botany 118.)

119. Introductory Mycology (5) I. MacDonald (Plant Pathology)
Lecture—3 hours; laboratory—6 hours; one weekend field trip. Prerequisite: Biological Sciences 1A, 1B, 1C. Introduction to structure, ontogeny, and taxonomy of selected species of the major divisions of the fungi. Not open for credit to students who have completed Botany 119. (Former course Botany 119.)

120. Introduction to Weed Science (3) II. Bayer
Lecture—2 hours; discussion—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C; Chemistry 8A, 8B. Principles of weed science including mechanical, biological, and chemical control methods. Weed control in crop, pasture, range, brush, forests, aquatic, and non-crop situations. Types of herbicides. Application of herbicides. Sight identification of common weeds and demonstrations to illustrate the principles. Not open for credit to students who have completed Botany 120. (Former course Botany 120.)

121. Biology of Weeds (3) III. Rejmanek
Lecture—2 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Origin and evolution, beneficial and harmful aspects, reproduction and dispersal, seed germination and dormancy, growth and development, ecology, interaction of weeds and crops, natural succession, and herbicide-induced succession. Laboratories will emphasize taxonomy of weeds and demonstrate principles discussed in lectures. Not open for credit to students who have completed Botany 121. (Former course Botany 121.)

122. Action of Herbicides (3) III. Bayer
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 120; Soil Science 100; courses 111, 111D recommended. Influence of plants and soils on the action of herbicides. Absorption, translocation, fate, mechanism of action and symptoms of herbicides in plants. Effects of herbicides on plant populations. Physical and molecular fate of herbicides in soils. Not open for credit to students who have completed Botany 122. (Former course Botany 122.)

125. Molecular Biology of Plant Development (3) III. Harada
Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C; Biological Sciences 103; Molecular and Cellular Biology 161 or course 111. Gene expression and gene structure and their influence on growth and differentiation of higher plant tissues. Not open for credit to students who have completed Botany 125. (Former course Botany 125.)

135. Mineral Nutrition of Plants (4) III. J. Richards (Land, Air and Water Resources) and Brown (Pomology)
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 111 or the equivalent. Evolution and scope of plant nutrition; essential and other elements; mechanisms of absorption and translocation; mineral metabolism; deficiencies and toxicities; genetic and ecological aspects of plant nutrition. (Same course as Plant Science 135.) Not open for credit to students who have completed Botany 135. (Former course Botany 135.)

***150. Biology and Management of Freshwater Macrophytes** (3) I. Anderson
Lecture—3 hours; two field trips. Prerequisite: Biological Sciences 1A, 1B, 1C, Chemistry 8B; course 111 or Water Science 122 recommended. Brief survey of common fresh water macrophytes, their reproductive modes, physiology, growth (photosynthesis, nutrient utilization), development (hormonal interactions), ecology and management. Offered in alternate years.

Not open for credit to students who have completed Botany 150. (Former course Botany 150.)

***155. Anatomical and Cytological Methods (4) III.** The Staff

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Practical laboratory methods in preparing biological materials for examination with the light microscope; special emphasis given to localization of cell constituents; introduction to photomicrography and autoradiography. Not open for credit to students who have completed Botany 55. (Former course Botany 155.)

189. Experiments in Plant Biology: Design and Execution (3) I, II, III. The Staff.

Laboratory/discussion—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C or the equivalent course in plant sciences, and consent of the instructor. Provides an opportunity for undergraduate students to formulate experimental approaches to current questions in plant biology and to carry out their proposed experiments. May be repeated for credit for a total of 12 units. (Former course Botany 189.) (P/NP grading only.)

190C. Research Conference in Botany (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: upper division standing in botany or related discipline; consent of instructor. Introduction to research methods in botany. Design of field or laboratory research projects, survey of appropriate literature, and discussion of research by faculty and students. May be repeated for credit. (Former course Botany 190C.) (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: upper division standing; consent of instructor. Technical and/or professional experience on or off campus. Supervised by a member of the Plant Biology Section faculty. (Former course Botany 192.) (P/NP grading only.)

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: open only to majors of senior standing on honors list. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis. Not open for credit to students who have completed Botany 194H. (Former course Botany 194H.) (P/NP grading only.)

197T. Tutoring in Botany (1-5) I, II, III. The Staff

Tutoring—1-5 hours. Prerequisite: upper division standing and consent of instructor. Designed for undergraduate students who desire teaching experience. Student contact will be primarily in laboratory or discussion sections. (Former course Botany 197T.) (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (Former course Botany 198.) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge.)

Prerequisite: consent of instructor. (Former course Botany 199.) (P/NP grading only.)

Concordance Table for Biological Sciences appears at the back of this catalog

Biomedical Engineering (A Graduate Group)

David F. Katz, Ph.D., Chairperson of the Group (916-752-1135 or 752-2504)

Group Office, 3078 Bainer Hall (Chemical Engineering), (916-752-2504/0400)

Faculty. Includes faculty members from the three colleges, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Biomedical Engineering offers programs of study and research leading to the M.S. and Ph.D. degrees. The programs of study are intended to prepare students for professional work in the effective integration of engineering with biology and medical sciences, including modeling of biological systems and the design of devices and procedures useful for human and veterinary medicine. It is a broad interdepartmental program which is best suited for students who are capable and comfortable with considerable independence. Each student together with an adviser defines a specific course of study suited to individual goals.

Preparation. The Group regards strong competence in mathematics and engineering as necessary for successful completion of study. Prior course work in these areas is emphasized in the evaluation of applications. Some such training can in principle be acquired after admission to the Group, but it generally necessitates one or more additional years of study.

Faculty Advisers. F.E. Curry, (*Human Physiology*); M. Hubbard (*Mechanical Engineering*); M.L. Hull (*Mechanical Engineering*); D. Katz (*Obstetrics and Gynecology, Chemical Engineering*); R.B. Martin (*Orthopaedic Surgery*); J.F. Shackelford (*Materials Science and Engineering*); R. Smith (*Electrical and Computer Engineering*).

Courses in Biomedical Engineering (BIM)

Graduate Courses

200. Introduction to Biomedical Engineering (2) I. Katz

Lecture—2 hours. Prerequisite: Biological Sciences 1A and 1B, Engineering 17, 36, and 45, and consent of instructor. Introduction to several primary fields of specialization in biomedical engineering. Fields include the following: 1) sensors, instrumentation, and signal processing; 2) orthopaedic biomechanics; 3) whole body biomechanics; 4) imaging; and 5) transport.

210. Introduction to Biomaterials (4) II. Shackelford

Lecture—4 hours. Prerequisite: Engineering 45 or consent of instructor. Mechanical and atomic properties of metallic, ceramic, and polymeric implant materials; corrosion, degradation, and failure of implants; inflammation, wound and fracture healing, blood coagulation; properties of bones, joints, and blood vessels; biocompatibility of orthopaedic and cardiovascular materials.

***225. Spatial Kinematics and Robotics (3) II.** Yang
Lecture—3 hours. Prerequisite: Mechanical Engineering 222. Spatial kinematics: Point and line coordinates and their transformations; concept of screw systems and instantaneous invariants for rigid body motion. Robotics: Solving for kinematics equations; differential relationships, motion trajectories. Application of dual-number matrices, screw calculus, and associated analytical methods. Offered in alternate years.

227. Research Techniques in Biomechanics (4) II. Williams, Hawkins
Lecture—2 hours; laboratory—4 hours; term paper/discussion—1 hour. Prerequisite: consent of instructor, Mathematics 22B; Physical Education 115 recommended. Experimental techniques for biomechan-

ical analysis of human movement are examined. Techniques evaluated include data acquisition and analysis by computer, force platform analysis, strength assessment, planar and three-dimensional videography, data reduction and smoothing, body segment parameter determination, electromyography, and biomechanical modeling. (Same course as Mechanical Engineering 227/Physical Education 227.)

228. Skeletal Muscle Mechanics: Form, Function, Adaptability (3) III. Hawkins

Lecture—3 hours. Prerequisite: graduate standing, consent of instructor, and basic background in biology, physiology, and engineering; Engineering 3 and 45, Mathematics 22B, and Neurobiology, Physiology and Behavior 110 recommended. Basic structure and function of skeletal muscle is examined at the microscopic and macroscopic level. Muscle adaptation in response to aging, disease, injury, exercise, and disuse. Special emphasis on the relation between muscle structure and muscle mechanics (e.g., force, work, power). (Same course as Physical Education 228.)

231. Musculo-Skeletal System Biomechanics (3) III. Hull

Lecture—3 hours. Prerequisite: Engineering 102, Mechanical Engineering 176. Mechanics of skeletal muscle and mechanical models of muscle, solution of the inverse dynamics problem, theoretical and experimental methods of kinematic and kinetic analysis, computation of intersegmental load and muscle forces, applications to gait analysis and sports biomechanics. Offered in alternate years. (Same course as Mechanical Engineering 231.)

232. Skeletal Tissue Mechanics (3) III. Martin

Lecture—3 hours; laboratory—1 hour. Prerequisite: Engineering 104B. Overview of the mechanical properties of the various tissues in the musculoskeletal system, the relationship of these properties to anatomic and histologic structure, and the changes in these properties caused by aging and disease. The tissues covered include bone, cartilage and synovial fluid, ligament and tendon. (Same course as Mechanical Engineering 232.)

***252. Advanced Information Systems (3) II.** Waters

Lecture—2 hours; laboratory—2 hours. Prerequisite: experience in initial phases of data preparation, editing and sorting; Computer Science Engineering 168 or the equivalent; must be able to perform at graduate level. To increase, through examples, projects and discussions, understanding of the components of information systems, including hardware, software, economics and people, and to prepare students to apply this understanding in the solution of specific problems in the creation, design and implementation of information systems.

290. Seminar (1) I, II, III. Katz

Seminar—1 hour. Seminar in biomedical engineering. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff

299. Research (1-12) I, II, III, IV. The Staff (S/U grading only.)

Biophysics (A Graduate Group)

Richard Nuccitelli, Ph.D., Chairperson of the Group
Group Office, 154 Briggs Hall (916-752-9091)

Faculty. Includes faculty members from the Departments of Molecular and Cellular Biology, Chemistry, Physics, and others, and the School of Medicine.

Graduate Study. The Graduate Group in Biophysics offers programs of study leading to the Ph.D. degree. Biophysics is a broad interdepartmental program that is ideal for students who are comfortable with considerable independence. The emphasis is on molecular biophysics. The curriculum consists of certain core courses in biology, chemistry, and physics, followed by specialty courses related to research interests.

Specific program requirements are decided upon by a curriculum committee consisting of a research supervisor, the graduate adviser, and a group member. The Committee meets to consider individual educational needs with the student.

Graduate Adviser. R.J. Baskin (Molecular and Cellular Biology).

Courses in Biophysics (BPH)

Graduate Courses

200. Current Techniques in Biophysics (2) III. The Staff

Lecture—2 hours. Prerequisite: graduate standing; Biological Sciences 102 or 104 or the equivalent. Current techniques in biophysics research including diffraction, magnetic resonance spectroscopy, calorimetry, optical spectroscopy, and electrophysiology. (Same course as Molecular and Cellular Biology 200C.) (S/U grading only.)

200LA. Biophysics Laboratory (3) I, II, III. The Staff (Chairperson in charge)

Laboratory—18 hours (5 weeks). Prerequisite: course 200 (may be taken concurrently). Laboratory assignment in the research laboratory of a Biophysics Graduate Group faculty member. Individual research problems with emphasis on methodological/procedural experience and experimental design.

200LB. Biophysics Laboratory (6) I, II, III. The Staff (Chairperson in charge)

Laboratory—two 18-hour rotations (5 weeks each). Prerequisite: course 200 (may be taken concurrently). Two five-week laboratory assignments in the research laboratories of Biophysics Graduate Group faculty members. Individual research problems with emphasis on methodological/procedural experience and experimental design.

290C. Research Conference in Biophysics (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: graduate standing in Biophysics and/or consent of instructor; course 299 concurrently. Presentation and discussion of faculty and graduate-student research in biophysics. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Botany

See Biological Sciences: Section of Plant Biology; Plant Science; and Plant Biology (A Graduate Group) for graduate study

Cantonese

See Asian American Studies

Cell and Developmental Biology (A Graduate Group)

Carol A. Erickson, Ph.D., Chairperson of the Group
(916-752-8318)

Group Office, 188 Briggs Hall (916-752-9091)

Faculty. The group includes 40 faculty members from 17 departments in the College of Agricultural and Environmental Sciences, College of Letters and Science, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Cell and Developmental Biology offers programs of study leading to the Ph.D. degree. Cell and Developmental Biology is a broad interdepartmental program. The curriculum consists of core courses in cell biology or developmental biology. Specific programs of study are decided upon by an advisory committee chaired by the student's research adviser, and the choice of major core courses will reflect the student's primary research interest.

Preparation. Appropriate preparation is an undergraduate degree in a biological or physical science. Preparation should include a year of calculus, physics, general chemistry and organic chemistry, and introductory courses in statistics, biochemistry, genetics and biology.

Graduate Advisers. J. Natzle (*Molecular and Cellular Biology*), S. Meizel (*Cell Biology and Human Anatomy*).

Courses in Cell and Developmental Biology (CDB)

Graduate Courses

200. Current Techniques in Cell Biology (2) I. Nuccitelli

Lecture—2 hours. Prerequisite: graduate standing; Biological Sciences 104 and Molecular and Cellular Biology 141 or the equivalent courses. Current techniques used in cell biology research including microscopy, spectroscopy, electrophysiology, immunocytochemistry, histology, organelle isolation, calorimetry, tissue culture and gel electrophoreses. Lectures are presented by experts on each technique, with an emphasis on pitfalls to avoid when using the technique. (Same course as Molecular and Cellular Biology 200A.) (S/U grading only.)

200LA. Cell and Developmental Biology Laboratory (3) I, II, III. The Staff

Laboratory—18 hours. Prerequisite: course 200 (may be taken concurrently). One five-week assignment in the research laboratory of a Cell and Developmental Biology Graduate Group member. Individual research problems with emphasis on methodological/procedural experience and experimental design.

200LB. Cell and Developmental Biology Laboratory (6) I, II, III. The Staff

Laboratory—18 hours. Prerequisite: course 200 (may be taken concurrently). Two five-week assignments in research laboratories of Cell and Developmental Biology Graduate Group members. Individual research problem with emphasis on methodological/procedural experience and experimental design.

***205. Cell Biology of the Cytoskeleton (2)** III. Tablin
Lecture—1 hour and discussion 1/2 hour (course hours entered to run sequentially); student presents critical analysis of current journal article and submits written outline and reference list for that publication. General organization of the cytoskeleton; introduction to cytoskeletal proteins: actin, tubulin, intermediate filaments, myosin, and other associated proteins. Presentation of current problems related to specialized cytoskeletal systems. Topics vary. (S/U grading only.) Offered in alternate years.

290. Current Topics in Cell and Developmental Biology (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Seminars presented by guest lecturers describing their research activities. May be repeated for credit. (S/U grading only.)

290C. Research Conference in Cell and Developmental Biology

(1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: graduate standing in Cell and Developmental Biology and/or consent of instructor; course 299 concurrently. Presentation and discussion of faculty and graduate-student research in cell and developmental biology. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Cell Biology and Human Anatomy

See Medicine, School of

Chemistry

(College of Letters and Science)

_____, Chairperson of the Department

_____, Vice-Chairperson of the Department

_____, Vice-Chairperson of the Department

Department Office, 108 Chemistry Building
(916-752-0503/0953; FAX 916-752-8995)

Faculty

Alan L. Balch, Ph.D., Professor
R. David Britt, Ph.D., Assistant Professor
Timothy C. Donnelly, Ph.D., Lecturer
W. Ronald Fawcett, Ph.D., Professor
William H. Fink, Ph.D., Professor
Edwin C. Friedrich, Ph.D., Professor
William M. Jackson, Ph.D., Professor
Susan M. Kauzlarich, Ph.D., Associate Professor
Joel E. Keizer, Ph.D., Professor
Peter B. Kelly, Ph.D., Associate Professor
Mark J. Kurth, Ph.D., Professor
Gerd N. LaMar, Ph.D., Professor
Donald P. Land, Ph.D., Assistant Professor
Carlito B. Lebrilla, Ph.D., Assistant Professor
August H. Maki, Ph.D., Professor
Donald A. McQuarrie, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*
Claude F. Meares, Ph.D., Professor
R. Bryan Miller, Ph.D., Professor
Tadeusz F. Molinski, Ph.D., Assistant Professor
W. Kenneth Musker, Ph.D., Professor
Krishnan P. Nambiar, Ph.D., Assistant Professor
Michael H. Nantz, Ph.D., Assistant Professor
Philip P. Power, Ph.D., Professor
Peter A. Rock, Ph.D., Professor
Carl W. Schmid, Ph.D., Professor
Neil E. Schore, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*
Kevin M. Smith, Ph.D., Professor
James H. Swinehart, Ph.D., Professor
Dino S. Tinti, Ph.D., Professor
Nancy S. True, Ph.D., Professor
Susan C. Tucker, Ph.D., Assistant Professor
Fred E. Wood, Ph.D., Lecturer

Emeriti Faculty

Thomas L. Allen, Ph.D., Professor Emeritus
 Lawrence J. Andrews, Ph.D., Professor Emeritus
 Albert T. Bottini, Ph.D., Professor Emeritus
 Robert K. Brinton, Ph.D., Professor Emeritus
 Hakon Hope, Cand. real., Professor Emeritus
 Raymond M. Keefer, Ph.D., Professor Emeritus
 Richard E. Kepner, Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award*
 Charles P. Nash, Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award*
 Edgar P. Painter, Ph.D., Professor Emeritus
 Joyce Takahashi, Ph.D., Adjunct Professor Emeritus
 Leo H. Sommer, Professor Emeritus
 David H. Volman, Ph.D., Professor Emeritus
 George S. Zweifel, Sc.D., Professor Emeritus

The Major Programs

Chemistry studies the composition of matter, its structure, and the means by which it is converted from one form to another.

The Program. Two programs in chemistry are available, one leading to the Bachelor of Arts and the other to the Bachelor of Science. Students who are interested in chemistry as a profession would normally elect the program leading to the B.S. degree, which is accredited by the American Chemical Society. The curriculum leading to an A.B. degree offers a less intensive program in chemistry and is appropriate for a student with a strong interest in chemistry, but who also has another goal such as professional school preparation or secondary school teaching.

Career Alternatives. Chemistry graduates with bachelor's degrees are employed extensively throughout industry in production supervision, quality control, technical marketing, and other areas of applied chemistry. Some of the firms employing these graduates are in the food and beverage processing industries, the petroleum industry, paper and textile production and processing, the chemical industry, pharmaceuticals, and the photographic industry. The bachelor programs also provide chemistry graduates with the rigorous preparation needed for the advanced degrees required for careers in research and education.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	36-39
Chemistry 2A-2B-2C or 2AH-2BH-2CH	15
Physics 5A-5B-5C	12
Mathematics 21A-21B-21C or 16A-16B-16C	9-12
Depth Subject Matter	39
Chemistry 110A, 110B, 110C, 124A, 128A, 128B, 128C, 129A, 129B	25
At least 14 additional upper division units in chemistry (except Chemistry 107A or 107B), biochemistry, or physics	14
Total Units for the Major	75-78

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	53
Chemistry 2A-2B-2C or 2AH-2BH-2CH	15
Physics 9A, 9B, 9C, 9D	16
Mathematics 21A, 21B, 21C, 21D, 22A, 22B	22
Depth Subject Matter	50
Chemistry 110A, 110B, 110C, 111, 115, 124A, 124B or 124C, 128A, 128B, 128C, 129A, 129B, 129C	38
At least 12 additional upper division units in chemistry (except Chemistry 107A, 107B), including one course with laboratory work	12
Total Units for the Major	103

Major Advisers. W.H. Fink, E.C. Friedrich, R.E. Kepner, R.B. Miller, N.E. Schore, D.S. Tinti, F.E. Wood.

Honors and Honors Program. The student must take courses 194HA, 194HB, and 194HC.

Graduate Study. The Department of Chemistry offers programs of study and research leading to the M.S. and Ph.D. degrees in Chemistry. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Chemistry. See also the Graduate Division section in this catalog.

Courses in Chemistry (CHE)**Lower Division Courses****1A, 1B, 1C. General Chemistry**

These courses have been cancelled and replaced by courses 2A, 2B, 2C.

2A. General Chemistry (5) I. Wood, Donnelly, Tinti; II. La Mar, Rock, Wood

Lecture—3 hours; laboratory/discussion—4 hours. Prerequisite: High school chemistry and physics strongly recommended; satisfactory score on diagnostic examination or course 9 with grade of C or better. Periodic table, stoichiometry, chemical equations, physical properties and kinetic theory of gases, atomic and molecular structure and chemical bonding. Laboratory experiments in stoichiometric relations, properties and collection of gases, atomic spectroscopy, and introductory quantitative analysis. General Education credit for non-GE course sequence (2A-2B) which will satisfy one GE course: Nature and Environment.

2AH. Honors General Chemistry (5) I. Maki

Lecture—3 hours; laboratory/discussion—4 hours. Prerequisite: High school chemistry and physics; satisfactory score on diagnostic examinations; Mathematics 21A (may be taken concurrently) or consent of instructor. Limited enrollment course with a more rigorous treatment of material covered in course 2A. Students completing course 2AH can continue with course 2BH or 2B.

2B. General Chemistry (5) II. Donnelly, Donnelly, Lebrilla; III. Donnelly, Rock, True

Lecture—3 hours; laboratory/discussion—4 hours. Prerequisite: course 2A or 2AH. Continuation of course 2A. Condensed phases and intermolecular forces, chemical thermodynamics, chemical equilibria, acids and bases, solubility. Laboratory experiments in thermochemistry, equilibria, and quantitative analysis using volumetric methods. General Education credit for non-GE course sequence (2A-2B) which will satisfy one GE course: Nature and Environment.

2BH. Honors General Chemistry (5) II. True

Lecture—3 hours; laboratory/discussion—4 hours. Prerequisite: course 2A with consent of instructor or course 2AH with a grade of C or better; and Mathematics 21B (maybe taken concurrently) or consent of instructor. Limited enrollment course with a more rigorous treatment of material covered in course 2B. Students completing course 2BH can continue with course 2CH or 2C.

2C. General Chemistry (5) I. Tucker, Jackson; III. Jackson and staff

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2B or 2BH. Continuation of course 2B. Kinetics, electrochemistry, spectroscopy, structure and bonding in transition metal compounds, application of principles to chemical reactions. Laboratory experiments in kinetics, electrochemistry, quantitative analysis using instrumental methods, qualitative analysis, and inorganic and organic synthesis.

2CH. Honors General Chemistry (5) III. Britt

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2B with consent of instructor or course 2BH with a grade of C or better; and Mathematics 21C (maybe taken concurrently) or consent of instructor. Limited enrollment course with a more rigorous treatment of material covered in course 2C.

4A, 4B, 4C. General Chemistry

These courses have been cancelled and replaced by courses 2AH, 2BH, 2CH.

8A. Organic Chemistry: Brief Course (3) I, II. The Staff

Lecture—3 hours. Prerequisite: course 1B with a grade of C or higher. With course 8B an introduction to the nomenclature, structure, chemistry, and reac-

tion mechanisms of organic compounds. Intended for students majoring in areas other than chemistry.

8B. Organic Chemistry: Brief Course (3) II, III. The Staff

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 8A. Continuation of course 8A. The laboratory is concerned primarily with the study of the properties and chemistry of the common classes of organic compounds.

9. Introduction to General Chemistry (2) I. Donnelly
 Lecture/discussion—3 hours. Prerequisite: chemistry diagnostic examination; not open for credit to students who have passed the exam or completed course 2A or 2AH. Introduction to chemistry. Students who complete course 9 will receive only 3 units credit for course 2A. Course 9 must be taken for a letter grade and may not be repeated. *For some offerings of this course, instruction may be by video.*

10. Concepts of Chemistry (4) I. The Staff
 Lecture—4 hours. A survey of basic concepts and contemporary applications of chemistry. Designed for non-science majors and not as preparation for Chemistry 1A. Course not open to students who have had Chemistry 1A; but students with credit for course 10 may take Chemistry 1A for full credit. General Education credit: Nature and Environment.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses**107A. Physical Chemistry for the Life Sciences (3) I.** Fink

Lecture—3 hours. Prerequisite: course 4C or 5 or consent of instructor. Mathematics 16C or 21C; one year of college level physics. A basic course in physical chemistry intended for majors in the life science areas. Introductory development of classical and statistical thermodynamics including equilibrium processes and solutions of nonelectrolytes. Kinetic theory of gases and liquids. Transport processes in liquids and solutions.

107B. Physical Chemistry for the Life Sciences (3) II. Britt

Lecture—3 hours. Prerequisite: course 107A or 110A. Continuation of course 107A. Electrochemistry and the thermodynamics of simple electrolyte solutions. Chemical rate processes. Introduction to spectroscopy, atomic and molecular structure, x-ray crystallography, radiation and nuclear chemistry, and to surface chemistry and colloidal systems. Considerations on bioirreversible processes.

108. Physical Chemistry of Macromolecules (3) III. Schmid

Lecture—3 hours. Prerequisite: course 107B or 110C. Physical properties and characterization of macromolecules with emphasis upon those of biological interest. Structural thermodynamic, optical and transport properties of polymers in bulk and in solution. Physical characterization methods. Special topics on the properties of polyelectrolyte systems.

110A. Physical Chemistry: Thermodynamics (3) I. Lebrilla; III. Fink

Lecture—3 hours. Prerequisite: course 5 or 4C; Mathematics 16C or 21C; one year of college physics. Development and application of the principles of chemical thermodynamics.

110B. Physical Chemistry: Quantum Mechanics (3) I. McQuarrie; II. The Staff

Lecture—3 hours. Prerequisite: course 110A. Atomic and molecular structure and spectra.

110C. Physical Chemistry: Kinetics (3) II. Fink; III. Faucett

Lecture—3 hours. Prerequisite: course 110B. Statistical thermodynamics, kinetic theory of gases, and chemical kinetics.

111. Physical Chemistry: Methods and Applications (4) I. Land; III. Tinti

Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 110C (may be taken concurrently) and 115. Introduction to the chemical literature, methods of data analysis, techniques of physical measurements, vacuum systems. Laboratory experiments from the areas of thermodynamics, spectroscopy, and kinetics.

115. Instrumental Analysis (4) II. Fawcett

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 110A. Theory and practice of modern instrumental techniques of chemical analysis with emphasis on electroanalytical and spectroscopic methods and separation science. Introduction to instrumentation electronics. Laboratory focuses on trace analyses of samples having practical significance.

118A. Organic Chemistry for Health and Life Sciences (4) I. Schore; III. The Staff

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 1Cor 4C with a grade of C- or higher. The 118A, 118B, 118C series is designed to fulfill the requirements of students planning professional school studies in health and life sciences. A rigorous, in-depth presentation of basic principles with emphasis on stereochemistry and on preparation and reactions of nonaromatic hydrocarbons, alkyl halides, alcohols and ethers.

118B. Organic Chemistry for Health and Life Sciences (4) I. Nambiar; II. The Staff

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 118A. Continuation of course 118A, with emphasis on spectroscopy and the preparation and reactions of aromatic hydrocarbons, organometallic compounds, aldehydes and ketones.

118C. Organic Chemistry for Health and Life Sciences (4) II. Kurth; III. Nambiar

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 118B. Continuation of course 118B, with emphasis on the preparation, reactions and identification of carboxylic acids and their derivatives, alkyl and acyl amines, β -dicarbonyl compounds, and various classes of naturally occurring, biologically important compounds.

***120. Physical Chemistry Laboratory: Advanced Methods** (3) II. _____

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 110C and 111. Design of experiments; experimental control and data acquisition using microcomputers. Laboratory emphasizes the use of microcomputers in advanced physical-chemical experiments.

121. Introduction to Molecular Structure and Spectra (4) III. The Staff

Lecture—4 hours. Prerequisite: course 110B. Modern theoretical and experimental methods used to study problems of molecular structure and bonding; emphasis on spectroscopic techniques.

124A. Inorganic Chemistry: Fundamentals (3) I. Kauzlarich

Lecture—3 hours. Prerequisite: course 1C or 4C. Symmetry, molecular geometry and structure, molecular orbital theory of bonding (polyatomic molecules and transition metals), solid state chemistry, energetics and spectroscopy of inorganic compounds.

124B. Inorganic Chemistry: Main Group Elements (3) II. The Staff

Lecture—3 hours. Prerequisite: course 124A. Synthesis, structure and reactivity of inorganic and heteroorganic molecules containing the main group elements.

124C. Inorganic Chemistry: d and f Block Elements (3) III. Balch

Lecture—3 hours. Prerequisite: course 124A. Synthesis, structure and reactivity of transition metal complexes, organometallic and bioinorganic chemistry, the lanthanides and actinides.

128A. Organic Chemistry (3) I. The Staff; II. Schore

Lecture—3 hours. Prerequisite: course 1C or 4C with a grade of C or higher; chemistry majors should enroll in course 129A concurrently. Introduction to the basic concepts of organic chemistry with emphasis on stereochemistry and the chemistry of hydrocarbons. Designed primarily for majors in chemistry.

128B. Organic Chemistry (3) II. Nantz; III. E. Molinski

Lecture—3 hours. Prerequisite: course 128A or consent of instructor, course 129A strongly recommended; chemistry majors should enroll in course 129B concurrently. Continuation of course 128A with emphasis on aromatic and aliphatic substitution reactions, elimination reactions, and the chemistry of carbonyl compounds. Introduction to the application of spectroscopic methods to organic chemistry.

128C. Organic Chemistry (3) I. Nantz; III. The Staff

Lecture—3 hours. Prerequisite: course 128B, chemistry majors should enroll in course 129C concurrently. Continuation of course 128B with emphasis on enolate condensations and the chemistry of amines, phenols, and sugars; selected biologically important compounds.

129A. Organic Chemistry Laboratory (2) I, II. The Staff

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 1C or 4C with a grade of C or higher; course 128A (may be taken concurrently). Introduction to laboratory techniques of organic chemistry. Emphasis is on methods used for separation and purification of organic compounds.

129B. Organic Chemistry Laboratory (2) II, III. The Staff

Laboratory—6 hours. Prerequisite: courses 128B (may be taken concurrently) and 129A. Continuation of course 129A. Emphasis is on methods used for synthesis and isolation of organic compounds.

129C. Organic Chemistry Laboratory (2) I, III. The Staff

Laboratory—6 hours. Prerequisite: courses 128C (may be taken concurrently) and 129B. Continuation of course 129B.

130. Qualitative Organic Chemistry (4) III. Miller

Lecture—1 hour; laboratory—9 hours. Prerequisite: courses 5, 128C, 129C. Application of physical and chemical techniques to the qualitative identification of organic compounds.

131. Modern Methods of Organic Synthesis (3) II. The Staff

Lecture—3 hours. Prerequisite: course 128C. Introduction to modern synthetic methodology in organic chemistry with emphasis on stereoselective reactions and application to multistep syntheses of organic molecules containing multifunctionality.

140. Synthetic Methods (4) III. Power

Lecture—1 hour; laboratory—9 hours. Prerequisite: courses 124A, 128C, 129C. Integrated inorganic-organic course in the preparation, purification and characterization of multifunctional organic, organometallic, and transition metal compounds using a wide range of methods.

150. Chemistry of Natural Products (3) I. Miller

Lecture—3 hours. Prerequisite: course 128C. Chemistry of terpenes, steroids, acetogenins, and alkaloids: isolation, structure determination, biosynthesis, chemical transformations, and total synthesis.

192. Internship in Chemistry (1-6) I, II, III. The Staff (Chairperson in charge)

Internship—3-18 hours. Prerequisite: upper division standing; project approval by faculty sponsor prior to enrollment. Supervised internship in chemistry; requires a final written report. May be repeated for credit for a total of 6 units. (P/NP grading only.)

194HA-194HB-194HC. Undergraduate Honors Research (2-2-2) I-II-III. The Staff (Chairperson in charge)

Independent study—2 hours. Prerequisite: open only to chemistry majors who have completed 135 units and who qualify for the honors program. Original research under the guidance of a faculty adviser, culminating in the writing of an extensive report. (Deferred grading only, pending completion of sequence.)

195. Industrial Chemistry (1) I. Kurth

Seminar—2 hours. Prerequisite: junior or senior standing in Chemistry. Designed to give Chemistry undergraduate students an in-depth perception of careers in the chemical industry. Professional chemists will

give seminars describing both research and career insights. The research seminar will be technical while the career-oriented seminar will be more general. (P/NP grading only.)

197. Projects in Chemical Education (1-4) I, II, III.

The Staff (Chairperson in charge) Discussion and/or laboratory. Prerequisite: consent of instructor. Participation may include development of laboratory experiments, lecture demonstrations, autotutorial modules or assistance with laboratory sessions. May be repeated for credit for a total of 12 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor based upon adequate preparation in chemistry, mathematics and physics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor based upon adequate preparation in chemistry, mathematics, and physics. (P/NP grading only.)

Graduate Courses***201. Basic Chemical Uses of Symmetry and Group Theory** (2) I. Power

Lecture—2 hours. Prerequisite: graduate standing in chemistry. Symmetry elements, operations and point group, molecular symmetry. Representations of groups. Applications to molecular orbitals and molecular vibrations.

205. Symmetry, Spectroscopy, and Structure (3) II. Balch

Lecture—3 hours. Prerequisite: course 201 or the equivalent. Vibrational and rotational spectra; electronic spectra and photoelectron spectroscopy; magnetism; electron spin and nuclear quadrupole resonance spectroscopy; nuclear magnetic resonance spectroscopy; other spectroscopic methods.

210A. Quantum Chemistry: Introduction and Stationary-State Properties (3) II. Tinti

Lecture—3 hours. Prerequisite: course 110B and 110C or consent of instructor. Stationary-state quantum chemistry: postulates of quantum mechanics, simple solutions, central field problems and angular momenta, hydrogen atom, perturbation theory, variational theory, atoms and molecules.

210B. Quantum Chemistry: Time-Dependent Systems (3) III. Tucker

Lecture—3 hours. Prerequisite: course 210A. Matrix mechanics and time-dependent quantum chemistry: matrix formulation of quantum mechanics, Heisenberg representation, time-dependent perturbation theory, selection rules, density matrices, and miscellaneous molecular properties.

210C. Quantum Chemistry: Molecular Spectroscopy (3) I. True

Lecture—3 hours. Prerequisite: course 210B. Molecular spectroscopy: Born-Oppenheimer approximation, rotational, vibrational and electronic spectroscopy, spin systems, and molecular photophysics.

211A. Advanced Physical Chemistry: Statistical Thermodynamics (3) I. Rock

Lecture—3 hours. Prerequisite: consent of instructor. Principles and applications of statistical mechanics; ensemble theory; statistical thermodynamics of gases, solids, liquids, electrolyte solutions and polymers; chemical equilibrium.

211B. Statistical Mechanics (3) III. McQuarrie

Lecture—3 hours. Prerequisite: course 211A. Statistical mechanics of nonequilibrium systems, including the rigorous kinetic theory of gases, continuum mechanics transport in dense fluids, stochastic processes, brownian motion and linear response theory. Offered in alternate years.

***212. Chemical Dynamics** (3) II. Jackson

Lecture—3 hours. Prerequisite: consent of instructor. Introduction to modern concepts in chemical reaction dynamics for graduate students in chemistry. Emphasis will be placed on experimental techniques as well as emerging physical models for characterizing chemical reactivity at a microscopic level. Offered in alternate years.

215. Theoretical and Computational Chemistry (3)

III. The Staff

Lecture—3 hours. Prerequisite: courses 211A and 210B or consent of instructor. Mathematics of wide utility in chemistry, computational methods for guidance or alternative to experiment, and modern formulations of chemical theory. Emphasis will vary in successive years. May be repeated for credit when topic differs. Offered in alternate years.

216. Magnetic Resonance Spectroscopy (3) II. The Staff

Lecture—3 hours. Prerequisite: courses 210A, 210B (may be taken concurrently). Quantum mechanics of spin and orbital angular momentum, nuclear magnetic resonance, theory of chemical shift and multiplet structures, electron spin resonance, theory of g-tensor in organic and transition ions, spin Hamiltonians, nuclear quadrupole resonance, spin relaxation processes. Offered in alternate years.

217. X-Ray Structure Determination (3) II. ———

Lecture—3 hours. Prerequisite: consent of instructor. Introduction to x-ray structure determination; crystals, symmetry, diffraction geometry, sample preparation and handling, diffraction apparatus and data collection, methods of structure solution and refinement, presentation of results, text, tables and graphics, crystallographic literature.

218. Physical Principles of Macromolecular Structure (3) III. Meares

Lecture—3 hours. Prerequisite: course 211A or the equivalent. Relationship of higher order macromolecular structure to subunit composition; equilibrium properties and macromolecular dynamics; physical-chemical determination of macromolecular structure. Offered in alternate years.

219. Spectroscopy of Organic Compounds (3) I. Molinski

Lecture—3 hours. Prerequisite: course 128C or the equivalent. Identification of organic compounds and investigation of stereochemical and reaction mechanism phenomena using spectroscopic methods—principally NMR, IR, and MS.

***221A-H. Special Topics in Organic Chemistry (3)**

I, II, III. The Staff

Lecture—3 hours. Selected topics of current interest in organic chemistry. Topics will vary each time the course is offered, and in general will emphasize the research interests of the staff member giving the course.

226. Principles of Transition Metal Chemistry (3) I. Balch

Lecture—3 hours. Prerequisite: course 124A or the equivalent. Electronic structures, bonding, and reactivity of transition metal compounds.

228A. Bio-inorganic Chemistry (3) III. Swinehart

Lecture—3 hours. Prerequisite: course 226 or consent of instructor. Defines role of inorganic chemistry in the functioning of biological systems by identifying the functions of metal ions and main group compounds in biological systems and discussing the chemistry of model and isolated biological compounds. Offered every third year.

***228B. Main Group Chemistry (3) III.** ———

Lecture—3 hours. Prerequisite: course 226 or consent of instructor. Synthesis, physical properties, reactions and bonding of main group compounds. Discussions of concepts of electron deficiency, hypervalency, and non-classical bonding. Chemistry of the main group elements will be treated systematically. Offered every third year. (Next offering: Spring 1996.)

***228C. Solid-State Chemistry (3) III.** Kauzlarich

Lecture—3 hours. Prerequisite: courses 124A, 110B, 226, or the equivalent. Design and synthesis, structure and bonding of solid-state compounds; physical properties and characterization of solids; topics of current interest such as low-dimensional materials, inorganic polymers, materials for catalysis. Offered every third year (next offering Spring 1995).

231. Organic Synthesis: Methods and Strategies (3) III. Kurth

Lecture—3 hours. Prerequisite: course 131 or the equivalent. Provides a broadly based discussion of

current strategies in synthetic organic chemistry. Focus on methods for constructing carbon frameworks, controlling relative stereochemistry, and controlling absolute stereochemistry. Retrosynthetic strategies will be discussed throughout the lectures.

233. Physical-Organic Chemistry (3) II. The Staff

Lecture—3 hours. Prerequisite: courses 128A-128B-128C and 110A-110B-110C or the equivalent. Introduction to elementary concepts in physical-organic chemistry including the application of simple numerical techniques in characterizing and modeling organic reactions.

235. Organometallic Chemistry in Organic Synthesis (3) III. Schore

Lecture—3 hours. Prerequisite: course 128C. Current trends in use of organometallics for organic synthesis; preparations, properties, applications, and limitations of organometallic reagents derived from transition and/or main group metals. Offered in alternate years.

236. Chemistry of Natural Products (3) II. ———

Lecture—3 hours. Prerequisite: course 128C or the equivalent. Advanced treatment of chemistry of naturally occurring compounds isolated from a variety of sources. Topics will include isolation, structure determination, chemical transformations, total synthesis, biological activity, and biosynthesis. Biosynthetic origin will be used as a unifying theme.

237. Bio-organic Chemistry (3) I. Nambiar

Lecture—3 hours. Prerequisite: course 128C or the equivalent. Structure and function of biomolecules; molecular recognition; enzyme reaction mechanisms; design of suicide substrates for enzymes; enzyme engineering; design of artificial enzymes and application of enzymes in organic synthesis. Offered in alternate years.

240. Advanced Analytical Chemistry (3) I. Fawcett

Lecture—3 hours. Prerequisite: courses 110A and 110 or the equivalent. Numerical treatment of experimental data; thermodynamics of electrolyte and non-electrolyte solutions; complex equilibria in aqueous and non-aqueous solutions; potentiometry and specific ion electrodes; mass transfer in liquid solutions; fundamentals of separation science, including column, gas and liquid chromatography.

241A-D. Special Topics in Analytical Chemistry (3) III. Land

Lecture—3 hours. Prerequisite: consent of instructor. Series of advanced, research-oriented, special-topics courses in analytical chemistry. Topics will vary each time course is offered.

261. Current Topics in Chemical Research (2) I, II, III. The Staff

Lecture—2 hours. Prerequisite: graduate standing in Chemistry or consent of instructor. Designed to help chemistry graduate students develop and maintain familiarity with the current and past literature in their immediate field of research and related areas. May be repeated for credit when topics differ.

263. Introduction to Chemical Research Methodology (3) I, II, III. The Staff

Laboratory/discussion—9 hours. Prerequisite: course 293 and graduate student standing in Chemistry; consent of instructor. Introduction to identification, formulation, and solution of meaningful scientific problems including experimental design and/or theoretical analyses of new and prevailing techniques, theories and hypotheses. May be repeated for credit when topic differs. (S/U grading only.)

264. Advanced Chemical Research Methodology (6) I, II, III. The Staff

Laboratory/discussion—18 hours. Prerequisite: course 263 or consent of instructor. Applications of the methodology developed in Chemistry 263 to experimental and theoretical studies. Advanced methods of interpretation of results are developed. Includes the preparation of manuscripts for publication. May be repeated for credit when topic differs. (S/U grading only.)

290. Seminar (2) I, II, III. Land, Power

Seminar—2 hour. Prerequisite: consent of instructor. (S/U grading only.)

293. Introduction to Chemistry Research (1) I. The Staff (LaMar in charge)

Discussion—2 hours. Designed for incoming graduate students preparing for higher degrees in chemistry. Group and individual discussion of research activities in the Department and research topic selection. (S/U grading only.)

295. Industrial Chemistry (1) I. Kurth

Seminar—2 hours. Prerequisite: graduate standing in Chemistry. Designed to give Chemistry graduate students an in-depth perception of careers in the chemical industry. Professional chemists will give seminars describing both research and career insights. The research seminar will be technical while the career-oriented seminar will be more general. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)**299. Research (1-12) I, II, III.** The Staff (Chairperson in charge)

The laboratory is open to qualified graduate students who wish to pursue original investigation. Students wishing to enroll should communicate with the department well in advance of the quarter in which the work is to be undertaken. (S/U grading only.)

Professional Courses**390. Methods of Teaching Chemistry (2) I, II, III.** The Staff

Lecture—1 hour; discussion—1 hour. Prerequisite: graduate student standing in Chemistry and consent of instructor. Practical experience in methods and problems of teaching chemistry. Includes analyses of texts and supporting material, discussion of teaching techniques, preparing for and conducting of discussion sessions and student laboratories. Participation in the teaching program required for Ph.D. in chemistry. May be repeated for credit. (S/U grading only.)

392. Advanced Methods of Teaching Chemistry (2) III. The Staff

Lecture—2 hours. Prerequisite: course 390. Advanced topics in teaching chemistry. Analysis and discussion of curricular design, curricula materials, teaching methods and evaluation. For students who are planning a career in teaching chemistry. (P/NP grading only.)

Chicana/Chicano Studies

(College of Letters and Science)

Beatriz Pesquera, Ph.D., Program Director
Program Office, Hart Hall, 2nd Floor (916-752-2421)
George Singh, Program Coordinator/Student Affairs
(916-752-2492)

Committee in Charge

Rina Alcalay, Ph.D. (*Rhetoric and Communication*)
Richard Berteaux, Ph.D. (*Environmental Design*)
Angie C. Chabram, Ph.D. (*Chicana/o Studies*)
Yvette Flores-Ortiz, Ph.D. (*Chicana/o Studies*)
Rosa Linda Fregoso, Ph.D. (*Chicana/o Studies, Women's Studies*)
Malaquias Montoya, B.F.A. (*Chicana/o Studies*)
Beatriz Pesquera, Ph.D. (*Chicana/o Studies*)
Adaljiza Sosa-Riddell, Ph.D. (*Chicana/o Studies*)
Regugio I. Rochin, Ph.D. (*Chicana/o Studies, Agricultural Economics*)

Faculty

Angie C. Chabram, Ph.D., Associate Professor
(*Chicana/o Studies*)
Yvette Flores-Ortiz, Ph.D., Assistant Professor
(*Chicana/o Studies*)
Rosa Linda Fregoso, Ph.D., Associate Professor
(*Chicana/o Studies, Women's Studies*)
Malaquias Montoya, Professor (*Chicana/o Studies*)

Beatriz Pesquera, Ph.D., Associate Professor
(*Chicana/o Studies*)
Refugio I. Rochin, Professor (*Chicana/o Studies*,
Agricultural Economics)
Adaljiza Sosa-Riddell, Ph.D., Senior Lecturer
(*Chicana/o Studies*)

The Major Program

The Chicana/Chicano Program offers an interdisciplinary curriculum which focuses on the Chicana/Chicano experience through an analysis of class, race/ethnicity, gender and sexuality, and cultural expression. The program offers a major leading to the Bachelor of Arts degree and a minor that can satisfy breadth requirements for the College of Letters and Science. Both the major and minor frame an analysis within the historical and contemporary experiences of Chicanas/os in the Americas. The Chicana/Chicano Studies (Mexican-American) major gives students an opportunity to specialize within one of two emphases: a *Humanities/Arts emphasis* or a *Social Sciences emphasis*. Majors are expected to read, write, and speak Spanish at a level suitable for future study and work in Chicana/o and Latina/o settings. There are no language requirements for the minor. Minors must complete 24 units from courses specified below and must register for the minor at the Chicana/Chicano Studies Program Office. All Chicana/Chicano Studies courses are open to program minors and non-majors. Some upper division courses require prerequisites.

The Program. At the lower division level, the curriculum for the major provides an interdisciplinary overview of various topics. Students are advised to take lower division courses that serve as prerequisites for certain upper division courses. At the upper division level, majors pursue advanced interdisciplinary coursework in both the humanities/arts and the social sciences. At this level, students will find courses in Chicana/Chicano history; theory, and method; and several courses taught from a variety of disciplinary perspectives. The upper division courses give majors the opportunity to specialize in one of two emphases for the B.A. degree. Each emphasis has a different focus and each requires completion of different sets of courses. The *Humanities* emphasis integrates literature, culture, and artistic expression and provides a choice of focus in one of two subject areas: 1) creative arts/artistic representation, and 2) literature/cultural studies. The *Social Science* emphasis incorporates social theory, research methods, and a specialization in one of two areas: 1) community/political economy, and 2) family and society/health issues.

Career Alternatives. The Humanities/Arts emphasis prepares students for professional work in cross-cultural education, cultural/art centers, artistic expression and communications. The Social Sciences emphasis orients students towards professional work in human service delivery, community development, legal services assistance, health services, social welfare, and education. Both emphases in the major prepare students for advanced graduate and/or professional studies in related fields.

Chicana/Chicano (Mexican-American) Studies

A.B. Major Requirements:

Humanities/Arts Emphasis:	UNITS
Preparatory Subject Matter16-28	
Chicana/o Studies 10	4
Chicana/o Studies 50	4
One course from Chicana/o Studies 21, 30, or 40	4
One course from Chicana/o Studies 60, 70, or 73	4
Spanish 1, 2, 3, or 31, 32 and 33 or the equivalent	0-12
Depth Subject Matter48	
Chicana/o Studies 100	4
Two courses from History 166B, 169A, 169B	8

Two courses from Chicana/o Studies 110, 120, 132, or 140	8
Comparative ethnicity/gender: two upper division courses selected from two of the following areas	8
African American Studies, Asian American Studies, Native American Studies, or Women's Studies	
Electives, a minimum of 20 units from the following areas, at least 12 of which must be selected from one area only	20
<i>Area 1: Creative arts/artistic representation—Chicana/o Studies 156, 160, 171, 172</i>	
<i>Area 2: Literature/cultural studies—Chicana/o Studies 150, 154, 155; Linguistics 115, 116; Education 151; Women's Studies 170. (Linguistics 1 is recommended for students selecting Linguistics courses.)</i>	

Total Units for the Major64-76

Social Science Emphasis:

	UNITS
Preparatory Subject Matter16-28	
Chicana/o Studies 10	4
Chicana/o Studies 50	4
One course from Chicana/o Studies 21, 30, or 40	4
One course from Chicana/o Studies 60, 70, or 73	4
Sociology 46A	4
Spanish 1, 2, 3, or 31, 32, and 33 or the equivalent	0-12
Depth Subject Matter48	
Chicana/o Studies 100	4
Two courses from History 166B, 169A, 169B	8
Two courses from Chicana/o Studies 154, 155, or 160	8
Comparative ethnicity/gender: two upper division courses selected from two of the following areas	8
African American Studies, Asian American Studies, Native American Studies, or Women's Studies	
Electives, a minimum of 20 units from the following areas, at least 12 of which must be selected from one area only	20
<i>Area 1: Community/political economy—Chicana/o Studies 110, 111, 130, 132, 140.</i>	
<i>Area 2: Family and society/health issues—Chicana/o Studies 120, 121, 122, 131.</i>	

Total Units for the Major64-76

Master Adviser. R. Rochin.
Major Advisers. *Humanities/Arts emphasis:* A.C. Chabram, M. Montoya. *Social Science emphasis:* Y. Flores-Ortiz, B. Pesquera, R. Rochin.

Minor Program Requirements:

This minor provides the student with a broad overview of the status and experience of Chicanas/os and Latinas/os in society, and of the historical, social, political, economic, ideological and cultural forces that shape the Chicana/o experience. The minor requires students to attain an interdisciplinary perspective by including courses from the two emphases. The minor is open to all students with or without coursework in Spanish.

	UNITS
Chicana/o (Mexican-American) Studies24	
Chicana/o Studies 10	4
History 169A or 169B	4
Chicana/o Studies 110 or 120	4
Chicana/o Studies 130, 132, or 140	4
Chicana/o Studies 154, 155, or 171	4
Chicana/o Studies 111, 131, or Women's Studies 160	4

Minor Adviser. R. Rochin.

Courses in Chicana/o Studies (CHI)

Lower Division Courses

10. Introduction to Chicana/o Studies (4) I. Sosa-Riddell
Lecture—3 hours; discussion—1 hour. Analysis of the situation of the Chicana/o (Mexican-American) people, emphasizing their history, literature, political movements, education and related areas.

21. Chicana/o and Latina/o Health Care Issues (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 10. Overview of health issues of Chicanas/os and Latinas/os in the State of California; role of poverty/lack of education in limited access to health care.

30. United States Political Institutions and Chicanas/os (4) II. The Staff
Lecture/discussion—3 hours; term paper. Overview of the major political institutions and ideologies of the United States and the Chicana/o people's historical and contemporary role in, effects from, and responses to them. Theory, methods and critical analysis.

40. Chicanas/os in the Economy (4) II. Rochin
Lecture—4 hours. Introduction to Chicanos/Chicanas in the economy and related institutions. Topics include census counts, demographics, immigration, education, labor markets, local economies, and government roles and policies in employment and income generation. General Education credit: Contemporary Societies.

50. Chicana and Chicano Culture (4) II, III. The Staff
Lecture—3 hours; discussion—1 hour. Interdisciplinary survey of Chicana/o cultural representation in the 20th century. Examines Chicano culture within a national and transnational context. Explores how Chicano cultural forms and practices intersect with social/material forces, intellectual formations and cultural discourses. (Former course 20.)

60. Chicana and Chicano Representation in Cinema (4) III. Fregoso
Lecture with film viewing—8 hours. Introductory level study of Chicana and Chicano representation. The depiction of Chicana and Chicano experience by Chicana/o filmmakers, as well as by non-Chicanos, including independent filmmakers and the commercial industry. Offered in alternate years.

70. Survey of Chicana/o Art (4) Montoya
Lecture—4 hours. Survey of contemporary Chicana/o art in context of the social turmoil from which it springs. Includes political use of the poster and the mural, the influence of the Mexican mural and graphic movement, and social responsibility of the artist.

73. Chicana/o Art Expression Through Silk Screen (4) I. Montoya
Studio—8 hours; laboratory—4 hours. Introductory level studio course using silk screen and basic printing techniques to explore and develop images of Chicana/o cultural themes and expressions. Students will experiment with images and symbols from their immediate environment/culture. Integrated approach to Chicana/o philosophy of art.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100. Chicana/Chicano Theoretical Perspective (4) II. The Staff (Director in charge)
Lecture/discussion—3 hours; term paper. Prerequisite: courses 10 and 50. Critical examination of emerging Chicana/Chicano Studies theoretical perspectives in light of contemporary intellectual frameworks in the social sciences, arts, and humanities. Includes analysis of practices of self-representation, and socio-cultural developments in the Chicana/o community.

*Course not offered this academic year.

110. Sociology of the Chicana/o Experience (4) III. Pesquera

Lecture/discussion—4 hours. Prerequisite: course 10 or Sociology 1. The Chicana/o experience in the American society and economy viewed from theoretical perspectives. Immigration, history of integration of Chicana/o labor into American class structure, education inequality, ethnicity, the family and Chicana/o politics. (Former course Sociology 110.)

111. Chicanas/Mexicanas in Contemporary Society (4) II. Pesquera

Lecture/discussion—4 hours. Prerequisite: course 10 or 50, Women's Studies 50 or History 169B. Analysis of the role and status of Chicanas/Mexicanas in contemporary society. Special emphasis on their historical role, the political, economic and social institutions that have affected their status, and their contributions to society and their community. (Former course 102.)

120. Chicana/o Psychology (4) III. Flores-Ortiz

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21; introductory psychology course recommended. Introduction to the field of Chicana/o psychology. Analysis of socio-cultural context of Chicanas/os and Latinas/os. Special attention to issues of ethnic identity development, bilingualism, and development of self esteem. Impact of minority experience, migration, acculturation are examined.

121. Chicana/o Community Mental Health (4) I. Flores-Ortiz

Lecture—3 hours; term paper. Prerequisite: course 10 or 20. Mental health needs, problems, and service utilization patterns of Chicanas/os and Latinas/os will be analyzed. An analysis of social service policy, and the economic context of mental health programs.

122. Psychology Perspectives Chicana/o and Latina/o Family (4) II. Flores-Ortiz

Lecture—4 hours. Prerequisite: course 10; introductory psychology course highly recommended, and/or consent of instructor. Role of migration and acculturation on family structure and functioning. From a psychological and Chicana/o Studies perspective, contemporary gender roles and variations in family structures are examined. Special topics: family violence, addiction, family resilience and coping strategies.

130. United States-Mexican Border Relations (4) III. Riddell

Lecture—3 hours; term paper. Prerequisite: upper division standing. Theories of U.S.-Mexican border relations, with an overview of the political, economic, and social relationships and an in-depth analysis of immigration issues, border industrialization, women's organizations, economic crises, and legal issues.

131. Chicanos in Politics and Public Policy (4) II. Sosa-Riddell

Lecture/discussion—4 hours. Prerequisite: course 30 or Political Science 1. Historical and political analysis of Chicana/Latina political involvement and activities in the general political system, women's movement, Chicano movement, and Chicana movement. Course also examines the public policy process and the relationship of Chicanas/Latinas to public policy formation. Offered in alternate years.

132. Political Economy of Chicana/o Communities (4) III. Riddell

Lecture—3 hours; term paper. Prerequisite: upper division standing; lower division Chicana/o Studies course recommended. Historical and contemporary study of political and economic forces which define and influence the development of Chicana/o communities. Includes critiques of traditional and Marxian theories and concepts applicable to Chicana/o communities, case studies of Chicana/o communities, especially in California and Texas. General Education credit: Contemporary Societies.

140. Chicana/o Ethnicity and Socio-Economic Inequalities (4) III. Rochin

Lecture/discussion—4 hours. Prerequisite: upper division standing. Cross-sectional comparisons of socio-economic inequalities facing ethnic minorities and, in particular, Chicanas/os in the economy. Sub-topics include theories and concepts for studying ethnicity

and inequalities correlated with factors of demographics, immigration, education, labor markets, employment, occupations, housing and health.

154. The Chicana/o Novel (4) II. Dernersesian

Lecture—4 hours. Prerequisite: intermediate Spanish or consent of instructor. Introduction to the forms and themes of the Chicana/o novel with special attention to the construction of gender, nationality, sexuality, social class, and the family by contemporary Chicana and Chicana/o novelists. Bilingual readings, lectures, discussions, and writing in Spanish. (Former course Spanish 126A.)

155. Chicana/o Theatre (4) III. Dernersesian

Lecture—4 hours. Prerequisite: intermediate Spanish or consent of instructor. Examination of the formal and thematic dimensions of Chicana/o theater in the contemporary period with special emphasis on El Teatro Campesino and Chicana Feminist Theater. Bilingual readings, lectures, discussions, and writing in Spanish. (Former course Spanish 126B.)

156. Chicana/o Poetry (4) III. Dernersesian

Lecture—4 hours. Prerequisite: intermediate Spanish or consent of instructor. Survey of Chicana/o poetry with special emphasis on its thematic and formal dimensions. Bilingual readings, lectures, discussions, and writing in Spanish. (Former course Spanish 126C.)

171. Mexican and Chicana/o Mural Workshop (4) III. Montoya

Studio—8 hours; independent study—1 hour. Prerequisite: course 70 and/or written consent of instructor. The Mural: a collective art process that empowers students and people through design and execution of mural paintings in the tradition of the Mexican Mural Movement; introduces materials and techniques.

172. Chicana/o Voice/Poster/Silk Screen Workshop (4) II. Montoya

Studio—8 hours; independent study—1 hour. Prerequisite: course 70 and/or 73 and/or written consent of instructor. The poster as a voice art form used by Chicanas/os and other people of color to point to the defects of social and political existence and the possibility for change, from the Chicana/o artists' perspective.

192. Internship in Chicana/o and Latina/o Community (4) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour; internship—11 hours. Prerequisite: one course from 10, 21, or 50, or Spanish 3, or the equivalent. Combines academic guidance with internship in community agencies serving Mexican/Latino/Chicano clients. Utilization of bilingual skills, knowledge of history, culture, economics, politics, social issues and work experience. Internship project required. May be repeated twice for 12-unit maximum. (P/NP grading only.)

194HA-HB-HC. Senior Honors Research Project (2-5) I, II, III. The Staff

Independent study—6-15 hours. Prerequisite: senior standing in Chicana/o Studies major. Student is required to read, research, and write Honors Thesis on Chicana/o Studies topics. (Deferred grading only, pending completion of sequence.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: upper division standing and consent of Program Chairperson. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: upper division standing and consent of Program Chairperson. (P/NP grading only.)

Graduate Courses**299. Special Study for Graduate Students** (1-12) I, II, III. The Staff (Chairperson in charge)

Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Child Development (A Graduate Group)

Keith Barton, Ph.D., Chairperson of the Group
Group Office, 1303 Hart Hall (916-752-1926)

Faculty. Includes faculty members from the division of Human Development and the departments of Anthropology, Behavioral Biology, Education, Psychology, and the Schools of Law and Medicine.

Graduate Study. The Graduate Group in Child Development offers a multidisciplinary program leading to a M.S. degree. The aim of the program is to provide students with an opportunity to pursue a coordinated course of postgraduate study in the field of child development which cuts across departmental boundaries. Opportunities are provided to work with children and families in the community including the University's Early Childhood Laboratory. Recipients of the degree gain sufficient background in the biological and social sciences to engage in professions that directly (e.g., preschool) or indirectly (e.g., social policy) involve children and families, obtain positions in teaching or research settings, or pursue further study leading to a doctorate in child development, human development, clinical psychology, or related fields.

Admission applications must be in by *January 15*.

Graduate Adviser. Contact Group Office.

Chinese

See Chinese and Japanese
(below); Asian American
Studies; and East Asian Studies

Chinese and Japanese

(College of Letters and Science)

Robert Borgen, Ph.D., Chairperson of the
Department

Department Office, 184 Kerr Hall (916-752-4995)

Faculty

Robert Borgen, Ph.D., Professor (*Japanese*)
Chia-ning Chang, Ph.D., Assistant Professor (*Japanese*)

Susan Griswold, Ph.D., Assistant Professor
(*Japanese*)

Mau-sang Ng, Ph.D., Associate Professor (*Chinese*)
Michelle Yeh, Ph.D., Associate Professor (*Chinese*)

Emeriti Faculty

Donald A. Gibbs, Ph.D., Professor Emeritus
Key H. Kim, Ph.D., Professor Emeritus
Benjamin E. Wallacker, Ph.D., Professor Emeritus

Related Courses. See East Asian Studies course list.

The Major Program

The department serves the student in two ways: it offers a core language program in both Chinese and Japanese, and it offers courses in literature and cinema. The core language program is designed for students who have no background whatsoever in Japanese or Chinese. A separate program is designed for students who have prior language background.

The Program. A student elects to major in either Japanese or Chinese. Practical language skills are taught using the most modern methods so that upon

entering the upper division a student will have attained functional fluency in the spoken language (hearing and speaking) and the written language (reading and writing). By this time, students will have begun to read authentic texts and to write short compositions. Upper division courses balance the need to further language skills with the need to understand and appreciate the cultural richness of either Chinese or Japanese civilization. All students are encouraged to combine their study of Japan's or China's language and literature with courses in related fields, and to study abroad through the UC International Summer Session programs, the Education Abroad Program or through internships.

Career Opportunities. UCD graduates have learned that a major in Chinese or Japanese is a genuine, earned distinction that facilitates entrance to graduate programs and professional schools. In addition, job opportunities abound in virtually all career paths, especially for those who have completed study abroad.

Chinese

A.B. Major Requirements:

Preparatory Subject Matter19/34
 Chinese 1, 2, 3, 4, 5, 6; or 7, 17, 27; or 8, 18, 28; and one 4-unit lower division Chinese literature course

Recommended:
 Japanese 10, Linguistics 1, History 9A

Depth Subject Matter36
 Chinese 106, 107, 111, 112, 113, 114.....24
 Three courses selected from: Chinese 104, 105, 108, 109A-I, 110, 115, 116, 120, 130, 131, 132, 140, 160 12

Recommended:
 Japanese 101, 102, 103, 104, 105, 106; Anthropology 148A-148B; Art History 163A-163B; East Asian Studies 113; History 190A-190B-190C, 191A-191B; Religious Studies 172; or other advanced literature courses selected in consultation with the undergraduate adviser.

Total Units for the Chinese Major55/70

Japanese

A.B. Major Requirements:

Preparatory Subject Matter15/30
 Japanese 1, 2, 3, 4, 5, 6; or 8, 18, 28

Recommended:
 Japanese 10, 15, 25, Chinese 10, Linguistics 1, History 9B

Depth Subject Matter40
 Japanese 101, 102, 103, 111, 112, 113 ...24
 Eight units selected from: Japanese 104, 105, 106, 107, 108, 115, 131, 132, 133, 134, 135, 136, 201†8

Eight units selected from: Chinese 104, 105, 106, 107, 109A-I, 110; Anthropology 149A-149B; Art History 164; Comparative Literature 153; History 194A-194B-194C; Religious Studies 172; or other advanced literature courses selected in consultation with the undergraduate adviser8

Total Units for the Japanese Major55/70

†See College procedures governing undergraduate enrollment in a graduate course.

Minor Program Requirements:

Minors are offered in Chinese and in Japanese for students wishing to follow a formally recognized program of study in those languages and their literatures.

UNITS

Chinese.....20
Japanese20

All upper division courses, including both language courses and literature in translation courses, may be used to meet

this requirement. One approved lower division course (Chinese 10, 11, 50; Japanese 10, 15, 25, 50) may also be used. In addition, students must demonstrate their language proficiency, normally through completion of Chinese 111 or Japanese 111. Only four units from 192, 197T, 198, and 199 may be applied to the minor. For details, consult the undergraduate advisers.

Placement. Chinese 1 and Japanese 1 are intended for beginning students with no prior knowledge of those languages. Students who do have some knowledge but wish to improve their skills should meet with one of the advisers to discuss appropriate placement. Students must follow departmental guidelines for placement in all language courses and instructor approval is required for enrollment.

Student Advisers. C.N. Chang (*Japanese*), S. Griswold (*Japanese*), M. Yeh (*Chinese*).

Prerequisite Credit. No student may repeat a course if that course is a prerequisite for a course that has already been completed with a grade of C- or better.

Courses in Chinese (CHN)

Lower Division Courses

1. Elementary Chinese (5) I. The Staff
 Lecture/discussion—5 hours. Introduction to Chinese grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed Chinese 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1A. Intensive Elementary Modern Chinese (10) II. The Staff
 Lecture—5 hours; discussion—5 hours. Combines the work of courses 1 and 2 into a single quarter. Those who complete this course may go on to course 3.

2. Elementary Chinese (5) II. The Staff
 Lecture/discussion—5 hours. Prerequisite: course 1. Continuation of course 1 in the areas of grammar and basic language skills.

3. Elementary Chinese (5) III. The Staff
 Lecture/discussion—5 hours. Prerequisite: course 2. Continuation of course 2. Completion of grammar sequence and continuing practice of all language skills.

***3A. Situational Chinese (2) I, III.** The Staff
 Discussion—2 hours. Prerequisite: course 3 (may be taken concurrently). Instructor and students create a specific social situation and establish roles for student-participants. Using techniques of drama and substitution drills, students have greater opportunities to develop spoken skills than is possible in course 3.

4. Intermediate Chinese (5) I. The Staff
 Lecture/discussion—5 hours. Prerequisite: course 3 or the equivalent. Intermediate-level training in spoken and written Chinese in cultural contexts, based on language skills developed in course 3.

5. Intermediate Chinese (5) II. The Staff
 Lecture/discussion—5 hours. Prerequisite: course 4 or the equivalent. Intermediate-level training in spoken and written Chinese in cultural contexts, based on language skills developed in course 4.

6. Intermediate Chinese (5) III. The Staff
 Lecture/discussion—5 hours. Prerequisite: course 5 or the equivalent. Intermediate-level training in spoken and written Chinese in cultural contexts, based on language skills developed in course 5.

***6A. Situational Chinese (2) I, III.** The Staff
 Discussion—2 hours. Prerequisite: course 6 (may be taken concurrently.) Instructor and students create a specific social situation and establish roles for student-participants. Using techniques of drama and oral repetition, students develop spoken fluency and appropriateness of expression as skills requisite to internships and study in China.

7. Mandarin for Cantonese Speakers I (5) I. The Staff

Lecture—5 hours. Prerequisite: ability to read and write Chinese characters at the elementary school level. Accelerated training in spoken Mandarin, particularly in the phonetic transcription system known as *pinyin*, for students who already can read and write Chinese. Course assumes no knowledge of spoken Mandarin Chinese.

8. Accelerated Written Chinese I (5) I. The Staff
 Lecture—5 hours. Prerequisite: ability to speak and listen to Mandarin Chinese. Designed for students who already have some degree of fluency in spoken Mandarin, but who cannot read Chinese characters. This course concentrates on developing reading ability and accelerates progress to the upper division.

***10. Modern Chinese Literature (In English) (4) I.** The Staff
 Lecture—3 hours; discussion—1 hour. Introductory course requiring no knowledge of Chinese language or history. Reading and discussion of short stories and novels and viewing of two films. Designed to convey a feeling for what China has experienced in the twentieth century.

11. Great Books of China (In English) (4) II. Ng
 Lecture—3 hours; discussion—1 hour. Selected readings in English translation are supplemented with background information on periods, authors and the interrelationships of culture, literature and social change. Methods of analysis are introduced and applied in class discussions. General Education credit: Civilization and Culture.

17. Mandarin for Cantonese Speakers II (5) II. The Staff
 Lecture—5 hours. Prerequisite: course 7. Continuation of course 7. Training in spoken Mandarin for students who already can read and write Chinese.

18. Accelerated Written Chinese II (5) II. The Staff
 Lecture—5 hours. Prerequisite: course 8. Continuation of course 8. Designed to accelerate the progress of students who already know spoken Mandarin but cannot read or write Chinese characters.

27. Mandarin for Cantonese Speakers III (5) III. The Staff
 Lecture—5 hours. Prerequisite: course 17. Continuation of course 17. Prepares student for entering upper division courses in Chinese.

28. Accelerated Written Chinese III (5) III. The Staff
 Lecture—5 hours. Prerequisite: course 18. Continuation of course 18. More advanced written styles and syntax in Chinese will be dealt with. Students completing this course proceed to course 111, which starts the third-year Chinese, or to some other appropriate upper-division course.

50. Introduction to the Literature of China and Japan (3) II. Yeh
 Lecture—3 hours. Methods of literary analysis and their application to major works from the various genres of Chinese and Japanese literature (in translation), including film. East Asian cultural traditions will also be introduced. (Same course as Japanese 50.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
 (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
 (P/NP grading only.)

Upper Division Courses

104. Twentieth-Century Chinese Fiction (In English) (4) I. Ng
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or a course in Chinese history recommended. English language survey of Chinese fiction as it evolved amidst the great historical, social and cultural changes of the twentieth century. Thorough study of the most influential writers and genres.

***105. Western Influences on Twentieth-Century Chinese Literature (In English) (4) III.** Ng
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or History 9A recommended. Introduction of Western literary thought into modern China, the

*Course not offered this academic year.

experimentation with Western literary forms and techniques, and the development of Marxism in contemporary literary writing. Offered in alternate years.

106. Chinese Poetry (in English) (4) III. Yeh
Lecture—3 hours; discussion—1 hour. Prerequisite: History 9A or any course on traditional China recommended. Organized topically and chronologically, the lyric tradition is explored from the dawn of folk songs down to modern expressions of social protest. Topics include friendship, love, oppression, war, parting, death, ecstasy and beauty. All readings are in English.

107. Traditional Chinese Fiction (in English) (4) I. Ng
Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or a course in Chinese history. English-language course studying the dawn of Chinese fiction and its development down to modern times. Combines survey history with close reading of representative works such as *The Story of the Stone* and famous Ming-Qing short stories.

***108. Poetry of China and Japan (in English)** (4) II. Yeh
Lecture—3 hours; discussion—1 hour. A comparative approach to Chinese and Japanese poetry, examining poetic practice in the two cultures; includes a general outline of the two traditions, plus study of poetic forms, techniques, and distinct treatments of universal themes: love, nature, war, etc. Offered in alternate years. (Same course as Japanese 108.)

***109A-I. Topics in Chinese Literature (in English)** (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: depending on topic, course 10, 11, 104, 106, 107, or a course in Chinese history. Topics in Chinese literature may include: (A) crime and punishment; (B) love in poetry; (C) women writers; (D) the knight-errant; (E) the city in fiction; (F) the recluse; (G) the literature of twentieth-century Taiwan; (H) popular literature; (I) the scholar and the courtesan. Offered in alternate years.

110. Great Writers of China: Texts and Context (in English) (4) II. Yeh
Lecture—3 hours; discussion—1 hour. Prerequisite: any course from the General Education Literature Preparation List, or consent of instructor. Examination of major theoretical concepts and interpretive methods in the study of literature by using examples from the Chinese tradition; discussions of classical and modern works with an emphasis on the relations between literature, author, society, and culture. General Education credit: Civilization and Culture.

111. Modern Chinese: Reading and Discussion (4) I. Yeh
Lecture—3 hours; discussion—1 hour. Prerequisite: course 6 or the equivalent. Readings in modern Chinese newspaper articles, essays, and short stories, based on language skills developed in courses 1 through 6.

112. Modern Chinese: Reading and Discussion (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 111. Readings in modern Chinese newspaper articles, essays, and short stories, based on language skills developed in course 111.

113. Modern Chinese: Reading and Discussion (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 112. Readings in modern Chinese newspaper articles, essays, and short stories, based on language skills developed in course 112.

114. Introduction to Classical Chinese: Confucius (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 6 or consent of instructor. Texts from the Confucian canon are read with the assistance of prepared word glossaries so that while learning to read classical Chinese, the students also experience the most influential books in the history of China in their original texts.

115. Introduction to Classical Chinese: Mencius (4) II. Ng
Lecture—3 hours; discussion—1 hour. Prerequisite: course 114. Continues course 114 by reading selections from the text of the Mencius.

116. Introduction to Classical Chinese: Narrative Styles (4) III. Ng
Lecture—3 hours; discussion—1 hour. Prerequisite: course 115. Continues course 115 by reading selections from the Records of the Grand Historian and other early, influential works.

120. Advanced Chinese (4) I, II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or consent of instructor. Selected readings from all genres to develop advanced skills in reading, writing, aural comprehension, and translation. May be repeated once for credit.

***130. Readings in Traditional Chinese Fiction** (4) II. Ng
Lecture—1 hour; discussion—3 hours. Prerequisite: course 112 or the equivalent; course 114 recommended. Close reading in Chinese of representative works from the Tang Dynasty (618-907) to modern times. May be repeated once for credit when content varies.

***131. Readings in Traditional Chinese Poetry** (4) I. Yeh
Lecture—3 hours; discussion—1 hour. Prerequisite: course 6 or consent of instructor. Traditional Chinese poetry from its beginnings to the golden ages of Tang and Song, surveying forms and poets that best reveal the Chinese poetic sensibility and the genius of the language of Chinese poetry.

132. Readings in Modern Chinese Poetry (4) II. Yeh
Lecture—3 hours; discussion—1 hour. Prerequisite: course 6 or consent of instructor. Chinese poetry from the Literary Revolution of 1917 to the present, surveying works that embody exciting innovations and reflect the modernity of twentieth-century Chinese society and culture.

***140. Readings in Classical Chinese** (4) I, II, III. The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: consent of instructor. Study and philological analysis of selected texts from the first millennium of Imperial China. May be repeated twice for credit.

***160. The Chinese Language** (4) III. The Staff
Lecture/discussion—4 hours. Prerequisite: course 6 (may be taken concurrently); Linguistics 1 recommended. The Chinese language viewed in its linguistic context, synchronically and diachronically. Historical phonology, classical and literary language, rise of written vernacular, descriptive grammar of modern standard Chinese, dialectal variation, and sociolinguistic factors.

192. Chinese Internship (1-12) I, II, III. The Staff
Internship—3-36 hours to be arranged. Prerequisite: upper division standing and consent of instructor. Work experience in the Chinese language, with analytical term paper on a topic approved by instructor. (P/NP grading only.)

197T. Tutoring in Chinese (1-5) I, II, III. The Staff
Tutoring—1-5 hours. Prerequisite: consent of Department chairperson. Leading of small voluntary discussion groups affiliated with one of the Department's regular courses. May be repeated for credit, but only 2 units may be applied to the minor. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff
(Chairperson in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff
(Chairperson in charge)
(P/NP grading only.)

Graduate Course

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Courses in Japanese (JPN)

Lower Division Courses

1. Elementary Japanese (5) I. The Staff
Lecture/discussion—5 hours. Introduction to spoken and written Japanese in cultural contexts, with emphasis on communication. (Students who have successfully completed Japanese 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1A. Intensive Elementary Japanese (10) II. The Staff
Lecture—5 hours; discussion—5 hours. Combines the work of courses 1 and 2 into a single quarter. Those who complete this course may go on to course 3.

1B. Accelerated Intensive Elementary Japanese (15) Summer special session. The Staff
Lecture/discussion—15 hours. Combines the work of courses 1, 2, and 3, into a single 12-week summer session. Those who complete this course may go on to course 4 in the fall.

2. Elementary Japanese (5) II. The Staff
Lecture/discussion—5 hours. Prerequisite: course 1 or the equivalent. Continuation of training in basic spoken and written skills.

3. Elementary Japanese (5) III. The Staff
Lecture/discussion—5 hours. Prerequisite: course 2 or the equivalent. Continuation of training in basic spoken and written skills.

4. Intermediate Japanese (5) I. The Staff
Lecture/discussion—5 hours. Prerequisite: course 3 or the equivalent. Intermediate-level training in spoken and written Japanese in cultural context, based on language skills developed in course 3.

5. Intermediate Japanese (5) II. The Staff
Lecture/discussion—5 hours. Prerequisite: course 4 or the equivalent. Intermediate-level training in spoken and written Japanese in cultural context, based on language skills developed in course 4.

6. Intermediate Japanese (5) III. The Staff
Lecture/discussion—5 hours. Prerequisite: successful completion (C- or better) of course 5 or the equivalent. Intermediate-level training in spoken and written Japanese in cultural context, based on language skills developed in course 5.

8. Accelerated Japanese for Bilingual Students I (5) I. The Staff
Lecture—5 hours. Prerequisite: bilingual background in Japanese. A special course for students with some bilingual background in Japanese. Emphasis is on speaking at an educated level and learning to read and write Japanese. First of a three-course sequence accelerating advancement to upper division courses.

***10. Masterworks of Japanese Literature (in English)** (4) III. The Staff
Lecture—3 hours; discussion—1 hour. An introduction to Japanese literature: readings and discussion in English of important works from earliest times to the present.

***15. Introduction to Traditional Japanese Culture** (3) II. Borgen
Lecture—2 hours; discussion—1 hour. General introduction to Japanese culture from its beginnings through 1850, focusing on religion, thought, and the arts (visual and performing). Indigenous traditions and the assimilation of foreign influences will be discussed. Readings and discussions in English.

18. Accelerated Japanese for Bilingual Students II (5) II. The Staff
Lecture—5 hours. Prerequisite: course 8. Continues course 8. A special course for students with some bilingual background in Japanese. Emphasis is on increasing knowledge of kanji and on reading and writing longer passages. Second of a three-course sequence accelerating advancement to upper division courses.

25. Japanese Language and Culture (in English)

(4) I. Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Linguistics 1 or Anthropology 4 recommended. Classification and communication of experience in Japanese culture; principles of language use in Japanese society. Speech levels and honorific language, language and gender, minority languages, literacy. Role of Japanese in artificial intelligence and computer science. Offered in alternate years.

28. Accelerated Japanese for Bilingual Students III

(5) III. The Staff

Lecture—5 hours. Prerequisite: course 18. Continues course 18. A special course for students with some bilingual background in Japanese. Emphasis is on advanced training in formal and informal speech styles, discourse strategies in spoken and written Japanese, and on reading authentic works. Third of a three-course sequence accelerating advancement to upper division courses.

50. Introduction to the Literature of China and Japan

(3) II. Borgen

Lecture—3 hours. Methods of literary analysis and their application to major works from the various genres of Chinese and Japanese literature (in translation), including film. East Asian cultural traditions will also be introduced. (Same course as Chinese 50.)

98. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge)

(P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses**101. Japanese Literature in Translation: The Early Period**

(4) I. Borgen

Lecture—3 hours; discussion—1 hour. Early Japanese literature from the Nara to the end of the Heian period through a broad survey of the major literary genres such as lyric poetry, court diaries, prose narratives, poem-tales, and classical Chinese writings.

102. Japanese Literature in Translation: The Middle Period

(4) II. Griswold

Lecture—3 hours; discussion—1 hour. The major literary genres from the twelfth century to the second half of the nineteenth century including poetry, *renga*, military chronicles, *no* drama, Buddhist literature, *haiku*, *haibun*, *kabuki*, *bunraku*, plays and Edo prose narratives.

103. Japanese Literature in Translation: The Modern Period

(4) III. Chang

Lecture—3 hours; discussion—1 hour. Modern Japanese literature from the 1870s to the 1970s. Surveys representative literary works and ideas against the social and intellectual background of the Meiji, Taisho, and Showa periods.

***104. Modern Japanese Literature: War and Revolution**

(3) I. Chang

Lecture/discussion—3 hours. Perspectives and sensibilities with which major modern Japanese writers have interpreted the traumatic and often poignant experiences of war and socio-political upheavals from the late nineteenth century to the 1970s. Lectures, discussions, and readings in English. Offered in alternate years.

***105. Modern Japanese Literature: Hero and Anti-hero**

(3) II. Chang

Lecture/discussion—3 hours. The ways in which representative heroes and anti-heroes in modern Japanese literature perceive, confront, struggle with, and resolve a wide array of social, moral, and intellectual problems in their times. Lectures, discussions, and readings in English. Offered in alternate years.

106. Japanese Culture Through Films

(4) II. Fahy

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing. Aspects of Japanese culture such as love, the family, position of women, growing up, death, and the supernatural as portrayed in films by Kurosawa, Mizoguchi, Ichikawa, Ozu, and Itami. Lectures, discussion, and readings in English. Films with English subtitles. Offered in alternate years.

***107. Modern Japanese Autobiographies**

(in English) (4) I. Chang

Lecture—3 hours; term paper/discussion—1 hour. Prerequisite: upper division standing. Exploring the modern and contemporary Japanese social and cultural landscape through critical analysis of modern Japanese autobiographies by prominent and other authors in the 19th and 20th centuries. Offered in alternate years.

***108. Poetry of China and Japan (in English) (4) II. Borgen**

Lecture—3 hours; discussion—1 hour. A comparative approach to Chinese and Japanese poetry, examining poetic practice in the two cultures; includes a general outline of the two traditions, plus study of poetic forms, techniques, and distinct treatments of universal themes: love, nature, war, etc. Offered in alternate years. (Same course as Chinese 108.)

111. Modern Japanese: Reading and Discussion

(4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 6. Readings in modern Japanese short stories, newspaper articles, and essays; conversation practice based on these readings.

112. Modern Japanese: Reading and Discussion

(4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 111. Continuation of course 111.

113. Modern Japanese: Reading and Discussion

(4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 112. Continuation of course 112.

***114A. Spoken Japanese (2) I. The Staff**

Discussion—2 hours. Prerequisite: course 6 or the equivalent. Training in spoken Japanese for students with a basic working knowledge of the language. (P/NP grading only.)

***114B. Spoken Japanese (2) II. The Staff**

Discussion—2 hours. Prerequisite: course 114A or consent of instructor. Continuation of course 114A. Training in spoken Japanese for students with a basic working knowledge of the language. (P/NP grading only.)

***114C. Spoken Japanese (2) III. The Staff**

Discussion—2 hours. Prerequisite: course 114B or consent of instructor. Continuation of course 114B. Training in spoken Japanese for students with a basic working knowledge of the language. (P/NP grading only.)

***115. Japanese Composition (2) I. The Staff**

Lecture—2 hours. Prerequisite: course 6 or consent of instructor. Development of skills in the techniques of writing Japanese. Practice in short essay writing with an aim toward mastery of the vocabulary and syntax of written style Japanese.

131. Readings in Modern Japanese Literature:**1920-1945 (4) III. Chang**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or the equivalent. Fourth-year level reading of representative works of modern Japanese literature including short stories, novellas, diaries, memoirs, poetry and excerpts from novels and plays from 1920 through the militaristic era, to the end of the war years in 1945.

132. Readings in Modern Japanese Literature:*1945-1970 (4) II. Chang**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or the equivalent. Continuation of course 131, but may be taken independently. Covers selected texts from the immediate post-war years beginning in 1945 down to 1970 and the post-war recovery.

133. Readings in Modern Japanese Literature:*1970 to Present (4) II. Griswold**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or the equivalent. Continuation of course 132, but may be taken independently. Covers selected texts from 1970 to the present. Offered in alternate years.

***134. Readings in the Humanities: Traditional Culture**

(4) II. Borgen

Lecture—3 hours; discussion—1 hour or term paper. Prerequisite: course 113. Fourth-year level reading of modern works by major specialists on traditional Japanese culture: history, religion, thought, art, international relations, and literary history and criticism. Focus is equally on developing reading skills and learning about Japanese culture.

135. Readings in the Humanities: The Modern Period

(4) III. Chang

Lecture—3 hours; term paper. Prerequisite: course 113. Fourth-year level reading of authentic modern writings on Japanese culture, history, philosophy, society, religion, law, politics, international relations, aesthetics, and comparative culture by prominent critics, commentators, and scholars.

***136. Readings in Newspapers and Magazines (4)**

I. Griswold

Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or the equivalent. Fourth-year level reading of newspaper and magazine reports, articles, and editorials on domestic and international affairs relating to contemporary Japan. Offered in alternate years.

192. Japanese Internship (1-12) I, II, III. The Staff

Internship—3-36 hours to be arranged. Prerequisite: upper division standing and consent of instructor. Work experience in Japanese language, with analytical term paper on a topic approved by instructor. (P/NP grading only.)

197T. Tutoring in Japanese (1-5) I, II, III. The Staff

Tutoring—1-5 hours. Prerequisite: consent of Department chairperson. Leading of small voluntary discussion groups affiliated with one of the Program's regular courses. May be repeated for credit, but only 2 units may be applied to the minor. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates

(1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses***201. Introduction to Classical Japanese (4) I.**

Borgen

Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or the equivalent. Introduction to essential grammatical structure of classical Japanese using selections from classical Japanese prose and poetry.

***202. Introduction to Classical Japanese (4) II.**

Borgen

Lecture—3 hours; discussion—1 hour. Prerequisite: course 201. Readings of relatively easy texts of classical Japanese poetry and prose assisted by annotations written in modern Japanese.

***203. Introduction to Classical Japanese (4) III.**

Griswold

Lecture—3 hours; discussion—1 hour. Prerequisite: course 202. Readings of classical and pre-modern Japanese prose and poetry beginning with late Heian works and proceeding to Kamakura, Muromachi and later periods. Readings include plays, Edo narratives, classical Chinese text and early Meiji writings.

291. Seminar in Modern Japanese Literature:*Major Writers (4) III. Chang**

Seminar—4 hours. Prerequisite: any one of courses 131, 132, 133, 134, 135, or the equivalent. In-depth reading and critical analyses of major works by and critical literature on one or two prominent modern or contemporary writers such as Natsume Soseki, Mori Ogai, Shimazaki Tōson, Akutagawa Ryunosuke, Tanizaki Junichiro, Abe Kobo and Oe Kenzaburo. Offered in alternate years.

299. Research (1-12) I, II, III. The Staff

(SAU grading only.)

Classics

(College of Letters and Science)

David A. Traill, Ph.D., Program Director

Department Office (Spanish and Classics), 616
Sproul Hall (916-752-0835)

Faculty

Lynn E. Roller, Ph.D., Associate Professor

David A. Traill, Ph.D., Professor

Emeriti Faculty

Richard E. Grimm, Ph.D., Professor Emeritus

Wesley E. Thompson, Ph.D., Professor Emeritus

The Major Programs

Classics can be defined broadly or narrowly: broadly, it is the study of all aspects of ancient Greek and Roman life; narrowly, it is the study of the Greek and Latin languages and their literatures. The department offers three majors that reflect these different definitions of the subject: the Classical Civilization major offers a broad interdisciplinary approach to the world of the Greeks and Romans, while the Latin and Greek majors focus on language and literature.

The Program. The core of the major in classical civilization consists of a two-year study of either Latin or Greek during which students learn the rudiments of the language and read three or more major ancient authors in the original language. Students complete the major requirements by selecting about ten courses from a broad range of offerings on different aspects of classical civilization. Latin majors and Greek majors spend a year learning the rudiments of the language, then read a selection (36 units) of major Greek or Latin authors.

Career Opportunities. Majors in classics can make direct use of their knowledge in careers in library science, museum work, or high school teaching, or by going on to graduate work in classics, philosophy, art history, archaeology, history or theology. Students planning to go on to graduate work in classics should bear in mind that good graduate schools look for students who have a minimum of two year's work in both Latin and Greek and have reading knowledge of French or German. A degree in classics is also an excellent preparation for professional schools; in the past 20 years, practically all majors in classics from Davis who have sought admission to law or medical school have been accepted.

Classical Civilization

A. B. Major Requirements:

	UNITS
Preparatory Subject Matter	25-27
Greek 1, 2, 3 or Latin 1, 2, 3 or the equivalent.....	15
Three courses from the following, including at least one from group (a)	10-12
(a) Classics 17A, 17B, 17C, 20.	
(b) Classics 4A, 10, 15.	
Depth Subject Matter	40
Three upper division courses in Latin or Greek.....	12
At least 28 units from the following, with or without emphasis in a single area, chosen in consultation with a major adviser.....	28
(a) <i>Language and Literature</i> : All upper division courses in Latin and Greek; Classics 140, 141, 142, 143	
(b) <i>History</i> : History 111A, 111B, 111C, 102A, Religious Studies 102	
(c) <i>Art, Archaeology, and Drama</i> : Classics 174, 175, Art History 154A, 154B, 155, Dramatic Art 156	
(d) <i>Philosophy and Political Theory</i> : Philosophy 143, 161, 162, Political Science 118A, Rhetoric and Communication 110	
Total Units for the Major	65-67

Recommended

Art History 1A; History 2; Philosophy 21; Comparative Literature 1A; Religious Studies 40.

Greek

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	0-15
Greek 1, 2, 3 (or the equivalent)	15
Depth Subject Matter	36
Upper division units in Greek (two courses may be chosen from department-approved courses in related fields).	
Total Units for the Major	36-51

Recommended

Latin 1, 2, 3.

Latin

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	15
Latin 1, 2, 3 (or the equivalent).....	15
Depth Subject Matter	36
Latin 121.....	5
At least 31 additional upper division units in Latin.....	31
Total Units for the Major	36-51

Major Advisers. D.A. Traill, L.E. Roller (Classical Civilization); W.E. Thompson (Greek); and R.E. Grimm (Latin).

The Minor Program

The Department offers minors in Greek and Latin for those wishing to follow a shorter but still formally recognized program of study in classics.

Minor Program Requirements:

	UNITS
Greek	21
Greek 3	5
Four upper division courses in Greek.....	16
	UNITS
Latin	21
Latin 3	5
Four upper division courses in Latin	16

Prerequisite credit. Credit will not normally be given for a lower division course in Latin or Greek if it is the prerequisite of a course already successfully completed. Exceptions can be made by the Program Director only.

Graduate Program

The Department offers a master's degree in Classics with emphasis on either Greek or Latin. The program is suitable for high school teachers seeking to improve their qualifications and for students wishing to prepare themselves for admission to one of the more competitive doctoral programs in Classics. *Admission into the graduate program has been suspended.*

Courses in Classics (CLA)

Lower Division Courses

4A. Classical Civilization (3) II. The Staff
Lecture—3 hours. An introduction to the literature, art, and institutions of classical Greece. General Education credit: Civilization and Culture.

10. Greek and Roman Mythology (3) II, III. The Staff
Lecture—3 hours. Origin and development of myths and legends, their place in the religion, literature, and art of Greece and Rome.

15. Women in Classical Antiquity (4) III. Allan
Lecture—3 hours; term paper. Lives and roles of women in ancient Greece and Rome. Readings from the history, philosophy, medical and legal documents, literature and myth. General Education credit: Civilization and Culture.

17A. Mediterranean Bronze Age Archaeology

(4) I. Roller
Lecture—3 hours; term paper. Archeological monuments of the Ancient Near East, including Egypt and Mesopotamia, and of Greece and Crete during the Bronze Age. Special emphasis on the Minoan and Mycenaean civilizations. General Education credit: Civilization and Culture.

***17B. Greek Archaeology** (4) II. Roller
Lecture—3 hours; term paper. Archeological monuments of Geometric, Archaic, and Classical Greece, with special emphasis on the development of cities and sanctuaries. General Education credit: Civilization and Culture.

***17C. Later Greek and Roman Archaeology** (4) III. The Staff
Lecture—3 hours; term paper. Archeological monuments of the Greek world after the conquests of Alexander the Great, and the monuments of Rome and the Roman Empire. Offered in alternate years. General Education credit: Civilization and Culture.

***20. Pompeii AD 79** (4) III. Traill
Lecture—3 hours; term paper. Roman life in an urban community at the time of the eruption of Vesuvius. Slide presentations of the archeological evidence will be supplemented by selected readings from Petronius' *Satyricon* and other ancient authors. Offered in alternate years. General Education credit: Civilization and Culture.

***30. Greek and Latin Elements in English Vocabulary** (3) I. The Staff
Lecture—3 hours. Knowledge of Latin and Greek not required. Elements of Greek and Latin vocabulary for increased understanding of English word formation and improved ability to understand and retain unfamiliar words. Emphasis on Greek and Latin elements but other languages not neglected.

***31. Greek and Latin Elements in Technical Vocabulary** (3) III. The Staff
Lecture—3 hours. Knowledge of Greek and Latin not required. Elements of Greek and Latin vocabulary to increase understanding of English word formation in medical, scientific and technical terminology and improve ability to understand and retain unfamiliar terms.

***50. The Rise of Science in Ancient Greece** (4) II. Rosenstock
Lecture/discussion—3 hours; term paper. Prerequisite: Mathematics 16A or the equivalent. Study of the emergence of scientific rationality in ancient Greece and its political and social context; concentration on four areas: mathematics, medicine, cosmology, and psychology. Reading from the Presocratics, Hippocrates, Plato, Aristotle, and Hellenistic philosophers. General Education credit: Civilization and Culture.

Upper Division Courses

140. Homer and Ancient Epic (4) I. The Staff
Lecture—3 hours; term paper. Prerequisite: course 4A or 10 or Comparative Literature 1. Reading of *Iliad*, *Odyssey*, and *Aeneid* in English. Discussion of Homer's and Vergil's techniques of composition, the beliefs and values of their respective societies and the influence of Homer on Vergil. Offered in alternate years. General Education credit: Civilization and Culture.

***141. Greek and Roman Comedy** (4) III. The Staff
Lecture—3 hours; conference—1 hour. Readings in Aristophanes, Menander, Plautus, and Terence; lectures on the development of ancient comedy. Offered in alternate years. General Education credit: Civilization and Culture.

***142. Greek and Roman Novel** (4) I. Traill
Lecture—3 hours; term paper. Examination of the ancient Greek romances and their development into the grotesque realism of Petronius' *Satyricon*, and the religious mysticism of Apuleius' *The Golden Ass*.

***143. Greek Tragedy** (4) I. Allan
Lecture—3 hours; term paper. Prerequisite: course 4A or 10. Reading in English of selected plays of Aeschylus, Sophocles and Euripides. Lectures on the development and influence of Athenian tragedy. Offered in alternate years. General Education credit: Civilization and Culture.

***150. Socrates and Classical Athens** (4) III. Rosenstock
Lecture/discussion—3 hours; term paper. Prerequisite: course 4A. Study of the major sources of our knowledge of Socrates to assess his role in the politics and culture of ancient Athens; his method of teaching and its place in Western thought. General Education credit: Civilization and Culture.

***174. Ancient Greek Sanctuaries** (4) III. Roller
Lecture/discussion—4 hours. Prerequisite: course 17B or consent of instructor. The history, cults, and monuments of Olympia, Delphi, and other sanctuaries. Student reports on major monuments. Offered in alternate years.

***175. Topography and Monuments of Ancient Athens** (4) III. Roller
Lecture/discussion—4 hours. Prerequisite: course 17A-17B or consent of instructor. The history of Athens as an urban center from the Bronze Age through the late Roman period. Student reports on major monuments with emphasis placed on restoration, chronology, and on the relating of documentary to excavational evidence. Offered in alternate years.

197TC. Community Tutoring in Classical Languages (1-5) I, II, III. The Staff
Tutoring—1-5 hours. Prerequisite: consent of instructor. Supervised instruction of Greek or Latin in nearby schools by qualified students in department. May be repeated for credit up to 5 units. (P/NP grading only.)

Graduate Courses

***201. Introduction to Classical Philology** (4) I. Traill
Seminar—3 hours; term paper. Survey of major contemporary areas of classical scholarship with special attention devoted to current problems in literary and textual criticism.

***202. Homer** (4) II. Roller
Seminar—3 hours; term paper. Readings in the *Iliad* and *Odyssey*; the origins and transmission of the poems.

***203. Vergil** (4) I. Traill
Seminar—3 hours; term paper. Reading of selected books of the *Bucolics*, *Georgics*, and *Aeneid*. Emphasis will be placed on the study of Vergilian poetic language.

***204. Greek and Roman Comedy** (4) II. The Staff
Seminar—3 hours; term paper. Historical and critical problems in Aristophanes or New Comedy. May be repeated for credit.

***205. Latin Lyric and Elegy** (4) III. Traill
Seminar—3 hours; term paper. Critical examination of the works of Catullus, Horace, or Propertius. May be repeated for credit.

***206. Greek Historiography** (4) II. Thompson
Seminar—3 hours; term paper. Development of historical writing in Greece. May be repeated for credit.

***207. Greek Drama** (4) II. The Staff
Seminar—3 hours; term paper. Literary and philological analysis of the plays of Euripides, Sophocles, or Aeschylus. May be repeated for credit.

299. Research (1-12) I, II, III. The Staff
Prerequisite: consent of instructor. (S/U grading only.)

Courses in Greek (GRK)

Lower Division Courses

1. Elementary Greek (5) I. The Staff
Lecture—5 hours. Introduction to the basic grammar and vocabulary of Classical and New Testament Greek. Development of translation skills with emphasis on Greek-English. (Students who have successfully completed Greek 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Greek (5) II. The Staff
Lecture—5 hours. Prerequisite: course 1. Continuation of course 1.

2NT. Elementary New Testament Greek (1) II. The Staff
Lecture—1 hour. Prerequisite: course 2 (concurrently). Supplementary study of New Testament Greek.

3. Intermediate Greek (5) III. The Staff
Lecture—5 hours. Prerequisite: course 2. Continuation of course 2. Selected readings from Greek authors.

3NT. Elementary New Testament Greek (1) III. The Staff
Lecture—1 hour. Prerequisite: course 3 (concurrently). Supplementary study of New Testament Greek.

98. Directed Group Study (1-5) I, II, III. The Staff (Program Director in Charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Attic Orators (4) I. Traill
Lecture—3 hours; term paper. Prerequisite: course 3.

***101. Plato** (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: course 3.

***102. Euripides** (4) I. Roller
Lecture—3 hours; term paper. Prerequisite: course 101.

***103A. Homer: Iliad** (4) I. The Staff
Recitation—3 hours; term paper. Prerequisite: course 3.

***103B. Homer: Odyssey** (4) II. The Staff
Recitation—3 hours; term paper. Prerequisite: course 3.

***104. Menander** (4) III. Thompson
Lecture—3 hours; term paper. Prerequisite: course 3.

***105. Demosthenes** (4) III. Thompson
Lecture—3 hours; term paper. Prerequisite: course 3.

***111. Sophocles** (4) II. Schein
Lecture—3 hours; term paper. Prerequisite: course 103.

***112. Aristophanes** (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 103.

113. Thucydides (4) III. Thompson
Lecture—3 hours; term paper. Prerequisite: course 103. Offered in alternate years.

***114. Lyric Poetry** (4) III.
Lecture—3 hours; term paper. Prerequisite: course 103. Offered in alternate years.

115. Aeschylus (4) II. Schein
Lecture—3 hours; term paper. Prerequisite: course 103. Offered in alternate years.

116. Herodotus (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 103. Offered in alternate years.

198. Directed Group Study (1-5) I, II, III. The Staff (Program Director in Charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Thompson in charge)
(P/NP grading only.)

Courses in Latin (LAT)

Lower Division Courses

1. Elementary Latin (5) I. The Staff
Lecture—5 hours. Introduction to basic grammar and vocabulary and development of translation skills with emphasis on Latin to English. (Students who have successfully completed Latin 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Latin (5) II, III. The Staff
Lecture—5 hours. Prerequisite: course 1. Continuation of course 1.

***2X. Intensive Latin** (10) III. The Staff
Lecture—10 hours. Prerequisite: course 1. Intensive course that covers the ground of courses 2 and 3 in a single quarter. Those who have completed course 2 may receive only 5 units for course 2X.

3. Intermediate Latin (5) III. The Staff
Lecture—5 hours. Prerequisite: course 2. Continuation of course 2. Selected readings from Latin authors.

98. Directed Group Study (1-5) I, II, III. The Staff (Program Director in Charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Ovid (4) I. Allan
Lecture—3 hours; paper. Prerequisite: course 3. Translation and discussion of selected readings from the works of Ovid.

***101. Livy** (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***102. Roman Comedy** (5) I. The Staff
Lecture—4 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***103. Vergil: Aeneid** (4) I. Traill
Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***104. Sallust** (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***105. Catullus** (4) I. Allan
Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

106. Horace: Odes and Epodes (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***108. Horace: Satires and Epistles** (4) I. The Staff
Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***109. Roman Elegy** (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***110. Caesar** (4) II. The Staff
Lecture—3 hours; substantial paper. Prerequisite: course 3. Translation and discussion of selected readings from Caesar. Grammar review and introduction to Latin prose composition. Offered in alternate years.

111. Silver Age Latin (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: course 3. Selections from Tacitus, Pliny, Petronius, Juvenal, Martial, and other writers of the Silver Age. Offered in alternate years.

***112. Cicero: Political Writings** (4) II. The Staff
Recitation—3 hours; term paper. Prerequisite: course 3.

***114. Cicero: Philosophical Works** (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***115. Lucretius** (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***116. Vergil: Eclogues and Georgics.** (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***121. Prose Composition** (5) I. Traill
Lecture—4 hours; term paper.

***125. Medieval Latin** (4) III. Traill
Lecture—3 hours; term paper. Prerequisite: course 3 and two upper division courses in Latin. Selected readings from the Vulgate and various medieval authors provide an introduction to the developments in the Latin Language and literature from the fourth to the fifteenth centuries. Offered in alternate years.

198. Directed Group Study (1-5) I, II, III. The Staff (Program Director in Charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Program Director in Charge)
(P/NP grading only.)

Clinical Nutrition and Metabolism

See Internal Medicine in Medicine, School of

Clinical Psychology

See Medicine, School of

Communication

See Rhetoric and Communication

Community Development (A Graduate Group)

Isao Fujimoto, Chairperson of the Group
Group Office, 1303 Hart Hall (Applied Behavioral Sciences), (916-752-1926)

Faculty. The interdisciplinary faculty include those in Anthropology, Asian American Studies, African American and African Studies, Landscape Architecture, Environmental Design, Geography, Psychology, Sociology, and Women's Studies.

Graduate Study. The Graduate Group in Community Development offers a multidisciplinary program of study which leads to the M.S. degree. The program is designed to prepare students for professional roles as administrators, designers, planners, researchers, or technicians with some emphasis upon rural, non-metropolitan communities and human service organizations. Training in community development is also aimed at preparing individuals to work within government or non-profit organizations in the realm of social and economic change. There is opportunity available for specialization in: (1) community design and planning, (2) ethnic and cultural diversity, (3) women's issues in the community, (4) community health and human services, (5) environmental issues, (6) rural and agricultural issues, and (7) community economic development.

Preparation. Applicants to this program can prepare themselves by enrolling for upper division courses in the social or behavioral sciences, e.g., anthropology, economics, sociology, psychology, cultural geography, or political science, and courses in community studies.

Graduate Advisers. Contact the Group Office.

Community and International Health

See Medicine, School of

Community Nutrition

(College of Agricultural and Environmental Sciences)

The Major Program

Community nutrition teaches students the identification of nutrition-related health problems and the biological, behavioral, economic, and sociocultural factors that influence the nutrition of individuals and groups. The aim of community nutrition is to apply this knowledge to the development of programs that improve the nutritional status in the community.

The Program. The community nutrition major is designed for students who seek to combine a foundation in the biological and nutritional sciences with study in the social sciences. All students in the major are required to complete a common core of preparatory and depth subject matter courses. Students select one of three subject matter options emphasizing sociocultural, psychological, or economic aspects of food, diet, and nutrition, and an additional area of concentration in consultation with the adviser.

Career Alternatives. The community nutrition major prepares students for jobs in administrative, teaching, research, or public health/public service positions or for graduate or professional training in nutrition and other health sciences. Students who complete the academic requirements for an internship in dietetics are also qualified for careers in dietetics, following completion of an internship.

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	49-50
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Chemistry (Chemistry 2A, 2B, 8A, 8B).....	16
Computer science (Agricultural Systems and Environment 21 or Computer Science Engineering 15).....	3-4
Cultural food habits (Nutrition 20).....	4
Cultural social science (Anthropology 2, Geography 2, or Sociology 3).....	4
Social research methods (Sociology 46A or Psychology 41).....	4
Statistics (Sociology 46B or Statistics 13).....	4
Breadth/General Education	6-24
Satisfaction of General Education requirement.....	6-24
(Note that some of the Option Subject Matter may meet General Education requirements.)	
Depth Subject Matter	52
Biological Sciences 102 and 103.....	6
Food Science and Technology 100A, 100B, 101A, 101B.....	10
Nutrition 110, 111, 112, 113, 116A, 116B, 118, 120, 190.....	27
Nutrition 192.....	2
Neurobiology, Physiology and Behavior 110, 110L.....	7
Option Subject Matter	28-32
Course work chosen from one of the following three options in consultation with adviser.....	18-20
Additional units in a related social or health science chosen in consultation with adviser.....	10-12
(May include a minor program in fields such as physical education, environmental toxicology, community development, statistics or the social sciences.)	

*Course not offered this academic year.

Behavioral-Psychological Option

Psychology 1, Education 110 or Psychology 130
Psychology 112 or Human Development 100A or 100B
Psychology 115 or Human Development 100C
Psychology 108, 129, 145, 165, 168, 180A, 180B, 180C
Applied Behavioral Sciences 173, 178
Consumer Science 100
Food Science and Technology 107, 117
Sociology 154
Anthropology 129, 130
Rhetoric and Communication 115

Economics and International Development Option

International Agricultural Development 10
Economics 1A, 1B
Mathematics 16A
Agricultural Economics 100A, 100B, 120, 130, 141
International Agricultural Development 103, 110, 111, 195
Economics 100, 101, 115A, 115B, 118, 123, 130, 162
Consumer Science 100
Anthropology 122, 126
Sociology 170
Economics 151A
Environmental Studies 1, 165
Rhetoric and Communication 115

Sociocultural Option

Foreign language (10 units or the equivalent strongly recommended)
Anthropology 101, 126, 133, 135
Geography 170, 175
Afro-American Studies 100
Applied Behavioral Sciences 2
Rhetoric and Communication 115
Regional courses, choose 8 units from one of the following four areas (alternative courses may be selected in consultation with the adviser)

North America: Anthropology 141A, 141C, 176, Geography 121, History 169A, 169B, Sociology 143A, 143B

Central and South America: Geography 122A, 122B, History 161A, 161B, 162, 163A, 163B, 165, 166A, 166B, 168

Africa: Anthropology 140A, 140B, Geography 125A, 125B, History 115A, 115B, 115C

Asia: Anthropology 142, 147, 148, 149, Geography 124, 127, History 137A, 137B, 137C, 138, 190A, 190B, 190C, 191A, 191B, 193, 194A, 194B, 194C, 195

Additional Recommended Courses Applied Behavioral Sciences 151, 152, Community Health 101, 160, 180, 194, Environmental Studies 126, Nutrition 114, 116AL, 116BL, 117, 129, 199, 219A, 219B, Sociology 106.

Unrestricted Electives.....

Total Units for Degree.....

Major Adviser. R.B. McDonald (*Nutrition*).

Advising Center for the major is located in 1151 Meyer Hall (916-752-2512).

Internship. To fulfill the academic requirements for an internship in Dietetics, the following courses must be included: Economics 1B, Agricultural Economics 112, Food Service Management 120, 120L, 121, 122, 123, Applied Behavioral Sciences 173 or Education 110, Psychology 1, Nutrition 116AL-116BL, and Rhetoric and Communication 1. Consult the Advising Center prior to the first quarter of the junior year for information on procedures.

Graduate Study. For information on graduate study, see the Graduate Studies section in this catalog.

Comparative Literature

(College of Letters and Science)

Seth L. Schein, Program Director

Program Office, 922 Sproul Hall (916-752-9934)

Committee in Charge

Salvatore Allosso, Ph.D. (*Comparative Literature*)

Gail Finney, Ph.D. (*Comparative Literature, German*)

Michele Hannoosh, Ph.D. (*Comparative Literature, French*)

Manfred Kusch, Ph.D. (*Comparative Literature, French*)

Kari Lokke, Ph.D. (*Comparative Literature, English*)

Harriet Murav (*Comparative Literature, Russian*)

Seth L. Schein, Ph.D. (*Comparative Literature*)

Robert M. Torrance, Ph.D. (*Comparative Literature*)

Marian B. Ury, Ph.D. (*Comparative Literature*)

Faculty

Salvatore Allosso, Ph.D., Lecturer (*Comparative Literature*)

Marc Eli Blanchard, Agrégé de Lettres, Professor (*French, Critical Theory*)

Gail Finney, Ph.D., Professor (*Comparative Literature, German*)

Michele Hannoosh, Ph.D., Associate Professor (*Comparative Literature, French*)

Manfred Kusch, Ph.D., Senior Lecturer (*Comparative Literature, French*)

Kari Lokke, Ph.D., Associate Professor (*Comparative Literature, English*)

Scott McLean, Ph.D., Lecturer (*Comparative Literature*)

Harriet Murav, Ph.D., Associate Professor (*Comparative Literature, Russian*)

Donna Reed, Ph.D., Lecturer (*Comparative Literature*)

Peter M. Schaeffer, Ph.D., Professor (*German*)

Seth L. Schein, Ph.D., Professor

Juliana Schiesari, Ph.D., Associate Professor (*Italian*)

Robert M. Torrance, Ph.D., Professor

Marian B. Ury, Ph.D., Professor

Emeriti Faculty

Ruby Cohn, Ph.D., Professor Emeritus

Roland W. Hoermann, Ph.D., Professor Emeritus

The Major Program

Comparative literature encourages students to read, think about, and compare books from different national languages and from different parts of the world. Comparative literature enlarges students' horizons by bridging the divisions between national cultures instead of concentrating on a single tradition.

The Program. Both the major and minor comparative literature programs allow students to combine courses in one or more national literature departments with courses in comparative literature. The introductory course sequence, "Great Books of Western Civilization" and "Major Books of the Contemporary World," provides both an overview of European literary culture from ancient times to the present and intensive practice in analytical thought and English composition. All readings in undergraduate comparative literature courses are in English, but majors take upper division courses in at least one foreign literature in the original language.

Career Alternatives. Careers directly related to comparative literature include teaching, journalism, publishing, and translating. Because many professional schools consider a literature major an excellent background for their graduate disciplines, comparative literature provides valuable preparation (supplemented with courses outside the major) for careers in business, government, medicine, or law.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter15-46

Comparative Literature 1, 2, 3.....12

One lower division course other than Comparative Literature 1, 2, 3, and 10A-N.....3-4
Foreign language: sufficient preparation to insure satisfactory performance at the upper division level.....0-30

Depth Subject Matter40

Five upper division courses (including at least three in a language other than English) distributed between the first and second literatures of concentration with the approval of the adviser20

Comparative Literature 1414

Two additional upper division Comparative Literature courses, including at least one in a major literary period (such as 164A-D), genre (such as 160A-B, 161A-B, or 166A-B), or movement (such as 168A-B or 169)8

Two additional upper division courses in one or both literatures of concentration or in Comparative Literature, selected with the approval of the adviser8

Total Units for the Major55-82

Recommended

Anthropology 2; Art History 10H; Classics 10; English 171A, 171B; French 114; History 101; Linguistics 1, 113; Philosophy 24, 123; Religious Studies 2.

Major Adviser. The Staff.

All Comparative Literature majors and minors must consult with their adviser, individually, at least once at the beginning and once at the end of each academic year.

Honors Program. Candidates for high or highest honors in Comparative Literature must write a senior thesis under the direction of a faculty member approved by the Program Director. For this purpose, in addition to fulfilling all other major requirements, honors candidates must enroll in 6 units of Comparative Literature 194H during the first two quarters of the senior year. Only students who have attained a cumulative GPA of 3.5 in all courses satisfying the major (except elementary foreign language courses) at the end of the junior year will be eligible for the honors program.

Minor Program Requirements:

The minor in Comparative Literature allows students to combine courses in Comparative Literature with courses in one or two national literatures, including English and foreign literatures in translation. There is no foreign language requirement for the minor.

UNITS

Comparative Literature24

Comparative Literature 1, 2, 3, or 44

At least two upper division Comparative Literature courses (Comparative Literature 141 strongly recommended)8

Three additional upper division courses in one or two national literatures (including English) or in Comparative Literature12

Courses should form a coherent program and should be chosen in consultation with, and with the approval of, the adviser.

Minor Adviser. Same as Major Adviser.

All Comparative Literature majors and minors must consult with their adviser, individually, at least once at the beginning and once at the end of each academic year.

Teaching Credential Subject Representative. The Staff. See also the Teacher Education Program.

Graduate Study. Refer to Comparative Literature (A Graduate Group). See also the Graduate Studies section in this catalog.

Courses in Comparative Literature (COM)

Lower Division Courses

1. Great Books of Western Civilization: From Myth to Faith (4) I, II, III. Director in Charge

Lecture/discussion—4 hours. Prerequisite: completion of Subject A requirement. An introduction, through class discussion and frequent written assignments, to some of the great books of western civilization from *The Epic of Gilgamesh* to St. Augustine's *Confessions*. General Education credit: Civilization and Culture.

2. Great Books of Western Civilization: From Faith to Reason

 (4) I, II, III. Director in Charge

Lecture/discussion—4 hours. Prerequisite: completion of Subject A requirement. An introduction, through class discussion and frequent written assignments, to some of the great books of western civilization from Dante's *Inferno* to Swift's *Gulliver's Travels*. General Education credit: Civilization and Culture.

3. Great Books of Western Civilization: The Modern Crisis

 (4) I, II, III. Director in Charge

Lecture/discussion—4 hours. Prerequisite: completion of Subject A requirement. An introduction, through class discussion and frequent written assignments, to some of the great books of western civilization from Goethe's *Faust* to Beckett's *Waiting for Godot*. General Education credit: Civilization and Culture.

4. Major Books of the Contemporary World: The Struggle for Freedom

 (4) I, II, III. The Staff

Lecture/discussion—4 hours. Prerequisite: completion of Subject A requirement. Comparative study of selected major Western and non-Western texts composed in the period from 1945 to the present. Intensive focus on writing about these texts, with frequent papers written about these works. General Education credit: Civilization and Culture.

5. Fairy Tales, Fables, and Parables

 (4) I, II, III. Reed, Allosso, and Staff

Lecture—3 hours; discussion—1 hour. An introduction to fairy tales, fables, and parables as recurrent forms in literature, with such readings as tales from Aesop and Grimm, Chaucer and Shakespeare, Kafka and Borges, Buddhist and Taoist parables, the Arabian Nights, and Afro-American folklore. General Education credit: Civilization and Culture.

6. Myths and Legends

 (4) I, II, III. McLean, Schildgen

Lecture—3 hours; discussion—1 hour. Introduction to the comparative study of myths and legends, excluding those of Greece and Rome, with readings from Near Eastern, Teutonic, Celtic, Indian, Japanese, Chinese, African and Central American literary sources. General Education credit: Civilization and Culture.

7. Literature of Fantasy and the Supernatural

 (4) I, III. Reed, Allosso

Lecture—3 hours; discussion—1 hour. An inquiry into the interrelations between the fantastic and the real in the literature of dream and hallucination, fabulous landscapes and voyages, grotesque satire, and gothic horror. General Education credit: Civilization and Culture.

8. Utopias and their Transformations

 (4) II. The Staff

Lecture/discussion—3 hours; term paper. Prerequisite: English A. A consideration, in literary works from different ages, of visionary and rational variations on the perfection of a lost paradise, Golden Age, or Atlantis—and of the inhuman nightmares that occasionally result from perversions of the utopian dream. General Education credit: Civilization and Culture.

9. The Short Story and Novella

 (4) II. Ury

Lecture/discussion—3 hours; term paper. An introduction to shorter forms of prose fiction by major authors of different countries, with special emphasis on the modern period. General Education credit: Civilization and Culture.

10A-N. Master Authors in World Literature

 (2) I, II, III. The Staff (Director in charge)

Lecture/discussion—1 two-hour session. Designed primarily to acquaint the non-literature major with a cross-section of writings by the world's most important authors; readings in English translation. Content alternates among the following segments: (A) *Gilgamesh*, *Ramayana*, *Beowulf*, *Nibelungenlied*; (B) *Metamorphoses*, *Decameron*, *Arabian Nights*, *Canterbury*

Tales; (C) *Chanson de Roland, El Cid, Igor's Campaign, Morte D'Arthur*; (D) *Sakuntala, Tristan and Isolde, Aucassin and Nicolette, Gawain and the Green Knight*; (E) Swift, Rabelais, *La Celestina, Simplicissimus*; (F) Cervantes, Saikaku, Fielding, Voltaire; (G) Machiavelli, Shakespeare, Lope de Vega/Calderón, Molière/Racine, Lessing/Schiller; (H) Goethe, Byron, Stendhal, Pushkin, Lermontov; (I) Hoffmann, Gogol, Poe, Hawthorne, Maupassant, Chekhov, Melville; (J) Flaubert, Twain, Turgenev, Galdós, Ibsen; (K) Balzac, Dostoevski/Tolstoi, Hardy, Shaw, Strindberg; (L) Unamuno, Svevo, Conrad, Gide, Kafka, Faulkner; (M) Rilke/Yeats, Joyce/Woolf, Mann/Céline, Bulgakov/Tanizaki, O'Neill/Brecht, Lorca/Pirandello; (N) Camus/Sartre, García Márquez/Grass, Borges/Sarraute, Bellow/Nabokov, Beckett/Pinter, Gene/ Dürrenmatt. May be repeated for credit in different subject area. Limited enrollment. (P/NP grading only.)

12. Introduction to Women Writers (4) III. The Staff Lecture/discussion—3 hours; term paper. Prerequisite: completion of Subject A requirement. Survey of fiction, drama, and poetry by women writers from all continents. Concerns of women compared in light of their varied social and cultural traditions. Students will practice literary analysis of voice, imagery, narrative strategies and diction. General Education credit: Civilization and Culture.

13. Dramatic Literature (3) III. Finney Lecture—3 hours. Prerequisite: Subject A or the equivalent. Introduction, through careful reading of selected plays, to some of the major forms of Western drama, from the earliest tragedies of ancient Greece to the contemporary American theater. Offered in alternate years. General Education credit: Civilization and Culture.

***14. Introduction to Poetry** (3) II. Hannoosh Lecture/discussion—3 hours. Prerequisite: completion of Subject A requirement. Comparative study of poetry in a variety of lyric and other poetic forms from different historical periods and different linguistic, national, and cultural traditions. Offered in alternate years. General Education credit: Civilization and Culture.

***15. The Spiritual Quest** (3) I. Torrance Lecture/discussion—3 hours. An exploration of the unending search to discover—or to create—a transcendent meaning and purpose in human life, as reflected in such works as the *Bhagavad Gita, The Quest of the Holy Grail, Dante's Purgatory*, and Melville's *Moby Dick*.

***16. Man and the Natural World** (4) II. McLean Lecture/discussion—3 hours; term paper. Examination of the changing relationship between the individual human being and his "natural" environment, whether cultivated or wild, as reflected in literary works from ancient times to the present by such authors as Hesiod, Virgil, Rousseau, Wordsworth, and Thoreau. General Education credit: Civilization and Culture.

***25. Ethnic Minority Writers in World Literature** (4) I, II. The Staff Lecture—3 hours; term paper. Consideration of a broad range of writers who speak from an ethnic perspective different from the nominally or politically dominant culture of their respective countries and who explore the challenges faced by characters significantly affected by their ethnic minority status. General Education credit: Civilization and Culture.

***53A. Literature of China and Japan** (3) II. Ury Lecture—2 hours; discussion—1 hour. Introduction to representative masterpieces of East Asia with readings from such works as *The Story of the Stone, The Peach Blossom Fan*, T'ang and Sung poetry, classical Japanese poetry, drama, and travel diaries, and *The Tale of Genji*.

***53B. Literature of India and Southeast Asia** (3) II. The Staff Lecture—2 hours; discussion—1 hour. Introduction to representative masterpieces of South Asia with readings from such works as the *Mahabharata* and *Ramayana, The Cloud Messenger, Shakuntala, The Little Clay Cart*, and the stories and poems of both

ancient and modern India and Southeast Asia. General Education credit: Civilization and Culture.

98. Directed Group Study (1-5) I, II, III. The Staff (Director in charge) Restricted to lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Director in charge) (P/NP grading only.)

Upper Division Courses

120. Writing Nature: 1750 to the Present (4) I. McLean

Lecture/discussion—3 hours; term paper. Prerequisite: completion of Subject A requirement and at least one course in literature. Study of representations, descriptions, and discussions of humankind's problematical relationship with the non-human world in texts written in a variety of European and American traditions between 1750 and the present. Offered in alternate years. General Education credit: Civilization and Culture.

135. Women Writers (4) II. Reed, Lokke Lecture/discussion—3 hours; term paper. An exploration of women's differing views of self and society as revealed in major works by female authors of various times and cultures. Readings, principally of fiction, will include such writers as Lady Murasaki, Mme de Lafayette, and Charlotte Bronte. General Education credit: Civilization and Culture.

138. Gender and Interpretation (4) I. Schiesari Lecture/discussion—3 hours; term paper. Prerequisite: completion of Subject A requirement and at least one course in literature. Study of the representation of gender roles and gender hierarchy in literary texts from various periods, societies, and cultures in light of research and theory on gender, with attention to gender as a topic for literary interpretation. General Education credit: Civilization and Culture.

140. Thematic and Structural Study of Literature (4) II. Murav

Lecture/discussion—3 hours; term paper. Interpretation of selected works illustrating the historical evolution of themes, as well as of formal and structural elements. May be repeated for credit when substance of course varies.

141. Literary Theory and Criticism (4) II. Torrance Lecture/discussion—3 hours; term paper. Exploration of literary theories with emphasis on specific objectives and possibilities of comparative literature. General Education credit: Civilization and Culture.

***142. Critical Reading and Analysis** (4) III. The Staff (Director in charge) Lecture/discussion—3 hours; term paper. Prerequisite: consent of instructor. Close reading of selected texts; scrutiny of very limited amount of material, with attention to the problems of texts in translation.

***144. The Grotesque** (4) II. Hannoosh Lecture/discussion—3 hours; term paper. Prerequisite: completion of Subject A requirement and at least one course in literature. Study of the "grotesque" in selected texts from the Renaissance to the 20th century, with attention to the "grotesque" as a means of social, cultural, and political commentary, as well as of aesthetic innovation. Offered in alternate years. General Education credit: Civilization and Culture.

***145. Representations of the City** (4) I. Hannoosh Lecture/discussion—3 hours; term paper. Examination of the portrayal of the modern city in 19th and 20th century western literature. Readings include works by Balzac, Dickens, Poe, Baudelaire, Dostoevsky, Whitman, Zola, T.S. Eliot, and William Carlos Williams.

***146. Myth in Literature** (4) II. Schaeffer, Lokke Lecture—3 hours; term paper. Prerequisite: course 6 recommended. Comparative study of different versions of one or more central myths, with attention to their cultural settings, artistic and literary forms of representation, as well as to their psychological dimensions.

152. Literature of the Americas (4) I. Blanchard Lecture/discussion—3 hours; term paper. Prerequisite: completion of Subject A requirement and at least

one course in literature. Study of the various stylistic, historical, social and cultural factors that contribute to a hemispheric vision of American literature, encompassing works by Canadian, United States, Caribbean, Brazilian, and Spanish-American writers. Offered in alternate years. General Education credit: Civilization and Culture.

***153. The Forms of Asian Literature** (4) III. Ury Lecture/discussion—3 hours; term paper. Prerequisite: upper division standing. Introduction to distinctive Asian literary forms, such as *haiku, noh*, the Chinese novel and tale, through reading of major works. Comparison with Western genres and study of native and Western critical traditions. General Education credit: Civilization and Culture.

157. War and Peace in Literature (4) II. Blanchard Lecture/discussion—3 hours; term papers. Prerequisite: course 1, 2, or 3, or consent of instructor. Through study of a few major works from Western and non-Western literature the course seeks to illuminate the way in which literature from antiquity to the present has dealt with the antinomy peace/war through the ages. General Education credit: Civilization and Culture.

***158. The Detective Story as Literature** (4) I. The Staff Lecture—3 hours; term paper. Study of the origins, literary and social background, development and implications of the literature of detection in a comparative context.

159A-G. Special Topics in Comparative Literature

(4) III. Ury Lecture/discussion—3 hours; term paper. Intensive study of selected subjects: ***159A** The Play Within the Play; ***159B** The Lyrical Novel; **(C)** Women in Literature; ***159D** The Role of Philosophy in Literature; ***159E** The Role of Psychology in Literature; ***159F** The Religious Experience in Literature; ***159G** Literary Attitudes and Judgment. May be repeated for credit in different subject area. General Education credit 159C: Civilization and Culture.

160A. The Modern Novel (4) III. Torrance Lecture/discussion—3 hours; term paper. The changing image of man and his world as seen in novels by such writers as Joyce, Proust, and Mann. General Education credit: Civilization and Culture.

***160B. The Modern Drama** (4) I. The Staff Lecture/discussion—3 hours; term paper. Readings in representative authors such as Ibsen, Strindberg, Chekhov, Pirandello and Brecht. General Education credit: Civilization and Culture.

161A. Tragedy (4) III. Schein Lecture/discussion—3 hours; term paper. Persistent and changing aspects of the tragic vision in literature from ancient times to the present. General Education credit: Civilization and Culture.

***161B. Comedy** (4) II. Finney Lecture/discussion—3 hours; term paper. Comic attitudes towards life in literary works of different ages. General Education credit: Civilization and Culture.

163. Biography and Autobiography (4) I. Ury Lecture/discussion—3 hours; term paper. Portrayals of a human life in biographies and/or autobiographies of different countries and ages. Offered in alternate years. General Education credit: Civilization and Culture.

***164A. The Middle Ages** (4) II. The Staff Lecture/discussion—3 hours; term paper. Readings in heroic epics, chivalric romances, and such major authors as Dante and Chaucer, with emphasis on shared assumptions concerning man's place in the world. General Education credit: Civilization and Culture.

***164B. The Renaissance** (4) I. Torrance Lecture/discussion—3 hours; term paper. Readings in major authors such as Petrarch, Machiavelli, Erasmus, Montaigne, Rabelais, Cervantes, and Shakespeare, with particular emphasis on changing conceptions of the possibilities and limitations of man. General Education credit: Civilization and Culture.

***164C. Baroque and Neoclassicism** (4) III. Torrance
Lecture/discussion—3 hours; term paper. Readings in major authors such as Calderón, Corneille, Pascal, Racine, Milton, and Grimmshausen, with consideration of the tension between the expansive energies of the "baroque" and the restraints of dogma and reason.

164D. The Enlightenment (4) III. Kusch
Lecture/discussion—3 hours; term paper. Readings in major authors such as Swift, Voltaire, Rousseau, Sterne, and Kant, with emphasis on philosophical ideas and literary forms. General Education credit: Civilization and Culture.

***166A. The Epic** (4) III. Schein
Lecture/discussion—3 hours; term paper. Study of various forms of epic poetry in both the oral and literary traditions. May be repeated for credit in different subject area. General Education credit: Civilization and Culture.

***166B. The Novel** (4) I. Hannoosh
Lecture/discussion—3 hours; term paper. Readings in various forms of the novel such as the picaresque, the developmental, and the confessional, with emphasis on the evolution of the genre. May be repeated for credit in different subject area. General Education credit: Civilization and Culture.

***167. Comparative Study of Major Authors** (4) I. Schein
Lecture/discussion—3 hours; term paper. Prerequisite: consent of instructor. Pivotal works of artists in the Western mainstream, such as Dante, Shakespeare, Cervantes, Goethe, Tolstoy, Proust, and Joyce.

168A. Romanticism (4) II. Lokke
Discussion—3 hours; term paper. Prerequisite: any introductory course in literature. Introduction to the Romantic movement with emphasis upon Romantic concepts of the self, irony, love, the imagination and artistic creativity, and the relationship of the individual to nature and society. General Education credit: Civilization and Culture.

168B. Realism and Naturalism (4) I. Finney
Discussion—3 hours; term paper. Prerequisite: consent of instructor. Novels and plays by Dickens, Zola, Flaubert, Dreiser, Ibsen, and Strindberg investigate marriage and adultery, the city and its perils, the hardships of industrialization, the war between the sexes, the New Woman, and other 19th-century themes. Offered in alternate years. General Education credit: Civilization and Culture.

***169. The Avant-Garde** (4) II. The Staff
Lecture/discussion—3 hours; term paper. Studies in movements such as surrealism, expressionism and the absurd. General Education credit: Civilization and Culture.

***170. The Contemporary Novel** (4) II. Torrance
Lecture—3 hours; term paper. Study of important novels from different parts of the world, including Asia, Africa, Latin America, Europe, and the United States, in the period from the Second World War to the present. General Education credit: Civilization and Culture.

180. Selected Topics in Comparative Literature (4) III. Murav
Lecture/discussion—3 hours; term paper. Prerequisite: completion of Subject A requirement and at least one course in literature. Study of a selected topic or topics appropriate to student and faculty interests and areas of specialization of the instructor. May be repeated once for credit when the topic differs.

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (Director in charge)
Independent study—1-5 hours. Prerequisite: open only to majors of senior standing who qualify for honors program. Guided research, under the direction of a faculty member approved by the Program Director, leading to a senior honors thesis on a comparative topic. (P/NP grading only.)

***195. Senior Seminar in Comparative Literature** (4) III. The Staff (Director in charge)
Seminar—3 hours; term paper. Prerequisite: senior standing and major in Comparative Literature, or consent of instructor. Advanced comparative study of selected topics and texts, with explicit emphasis on

the theoretical and interpretive approaches that define Comparative Literature as a discipline and distinguish it from other literary disciplines. May be repeated for credit when topic differs.

197T. Tutoring in Comparative Literature (1-5) I, II, III. The Staff (Director in charge)
Discussion—2-4 hours. Prerequisite: upper division standing with declared major in Comparative Literature. Tutoring in undergraduate courses including leadership in small voluntary discussion groups affiliated with current courses offered by Comparative Literature. May be repeated for credit for a total of 6 units. (P/NP grading only.)

198. Directed Group Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Director in charge) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Director in charge) (P/NP grading only.)

Graduate Courses

***200. Introduction to the Graduate Study of Comparative Literature** (4) II. Finney
Seminar—3 hours; research paper. Prerequisite: reading knowledge of one foreign language. Introduction to research tools, library resources, and critical concerns of Comparative Literature, with focus on the comparative study of a single work, culminating in a related research project.

201. Theories of Comparative Literature (4) II. Torrance
Seminar—3 hours; research paper. Prerequisite: reading knowledge of one foreign language; course 141 or the equivalent recommended. An examination of international theories of literature with reference to language, genre, thematics, social and historical context.

202. History of Literary Theory (4) I. Lokke
Discussion—3 hours; term paper. Prerequisite: graduate standing in Comparative Literature, English, or a foreign-language literature, or consent of instructor. Study of classical theoretical works from the Greeks to the late 19th century, with emphasis on these works' treatment of such topics as textuality, representation, genre, meaning, structure, style, allegory, and canonicity.

210. Topics and Themes in Comparative Literature (4) I, II, III. Schein, Finney, Hannoosh
Discussion—3 hours; term paper. Prerequisite: graduate standing in Comparative Literature, English, or a foreign-language literature, or consent of instructor. Comparative, interpretive study of the treatment of specific topics and themes in literary works from various periods, societies, and cultures, in light of these works' historical and sociocultural contexts. May be repeated for credit when topic differs.

***215. Forms of the Spiritual Quest** (4) III. Torrance
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor; knowledge of at least one foreign language. An exploration, culminating in a research paper, of changing forms of the quest for transcendence in different cultures, mainly in major works of Western literature, but also in other traditions and from the perspectives of other disciplines.

***220. Literary Genres** (4) I. Finney
Discussion—3 hours; term paper. Prerequisite: graduate standing in Comparative Literature, English, or a foreign-language literature, or consent of instructor. Comparative literature of major works in a particular genre from various linguistics, national, and cultural traditions, with particular attention to historical developments within the genre and to genre theory. May be repeated for credit when topic differs.

250A. Research in Comparative Literature (4) I, II, III. The Staff (Director in charge)
Individual instruction—1 hour. Prerequisite: course 200. Individually guided research, under the supervision of a faculty member, in a comparative topic culminating in a term paper. Required of M.A. and Ph.D. candidates.

250B. Research in Comparative Study of Author, Period, or Genre (4) I, II, III. The Staff (Director in charge)
Individual instruction—1 hour. Prerequisite: courses

200 and 201. Individually guided research, under the supervision of a faculty member, in the specialized study of an individual author, historical period, or literary genre culminating in a term paper. Required of Ph.D. candidates.

250C. Basic Research for the Dissertation (4) I, II, III. The Staff (Director in charge)
Individual instruction—1 hour. Prerequisite: courses 200 and 201. Individually guided research, under the supervision of a faculty member, in preparation for the dissertation in Comparative Literature. Required of Ph.D. candidates.

298. Directed Group Study (1-5) I, II, III
Prerequisite: graduate standing. (S/U grading only.)

299. Individual Study (1-12) I, II, III. The Staff (Director in charge) (S/U grading only.)

299D. Special Study for the Doctoral Dissertation (1-12) I, II, III. (S/U grading only.)

Professional Courses

390. Teaching Comparative Literature in College (3) I. Allosso
Lecture—1 hour; discussion—2 hours. Methods of teaching Comparative Literature with specific application to the introductory courses 1, 2, and 3, in relation to major cultural and social developments. Discussion also of ways to teach analytical writing. (S/U grading only.)

392. Teaching Internship in Comparative Literature (1) I, II, III. Allosso
Discussion—1 hour. Regular consultations between the student instructor teaching Comparative Literature courses and a supervisor. In-class evaluation of teaching. May be repeated for credit after consultation with supervisor. (S/U grading only.)

Comparative Literature (A Graduate Group)

Seth L. Schein, Ph.D., Chairperson of the Group,
(916-752-2239)

Group Office, 922 Sproul Hall (916-752-2239)

Faculty. The interdisciplinary faculty come from Comparative Literature, French, Italian, German, Russian, Spanish, and English.

Graduate Study. The Comparative Literature Program offers the M.A. and Ph.D. degrees with a strong emphasis on individual research under the supervision of a faculty member. Candidates for the M.A. combine study of Comparative Literature with study of two literatures (one of which may be English or American) in the original languages. Ph.D. candidates, in addition to further research of a comparative nature, study three literatures (one of which may be English and/or American) in the original languages, acquiring an extensive knowledge of the overall development of one. Within this framework, each student's program will be tailored to individual interests, and may center on a major historical period, such as the Renaissance or the modern age; a genre, such as lyric poetry, epic, drama, or the novel; or any other special emphasis approved by the Graduate Adviser.

Preparation. For admission to the Program, M.A. candidates should have an undergraduate major in literature and reading ability in one foreign language. Ph.D. candidates should have an undergraduate major in literature and reading ability in two foreign languages. The Group requires three letters of recommendation and a sample of recent written work, and it is recommended that students submit their GRE scores.

Graduate Adviser. M. Hannoosh (*Comparative Literature, French*).

Comparative Pathology (A Graduate Group)

Dennis W. Wilson, D.V.M., Ph.D., Chairperson of the Group

Group Office, 1126 Haring Hall (916-752-1385)

Graduate Study. The Graduate Group in Comparative Pathology offers the M.S. and Ph.D. degrees for graduate study in disciplines concerned with disease processes. The focus of the Group is on the study of the causes and nature of disease processes in animals and humans. Major emphasis is on the mechanisms responsible for the development of diseases at the organismal, cellular or subcellular level. To this study is brought a wide array of scientific knowledge so that students with divergent interests can be accommodated in programs designed for individual needs.

This program is primarily designed for students who have a professional medical degree, i.e., D.V.M., M.D., D.D.S. Students without a professional degree will not be considered unless they have an especially strong background in basic biomedical sciences.

Beyond core courses selected from disciplines such as anatomy, bacteriology, genetics, immunology, parasitology, pathology, physiology, and virology, course programs are intentionally flexible.

Graduate Adviser. J. G. Zinkl (*Pathology, Microbiology and Immunology*), D.H. Hinton (*Medicine and Epidemiology*), R.B. LaFebvre (*Pathology, Microbiology and Immunology*), H.J. Olander (*Pathology, Microbiology and Immunology*), K.M. Lam (*Medicine and Epidemiology*).

Computer Science

See Computer Science (below); Computer Science (A Graduate Group); Engineering: Computer Science; and Engineering: Electrical and Computer Engineering

Computer Science

(College of Letters and Science)

The Major Program

The computer science major is designed to prepare students for careers involving the design of computer systems and their application to science, industry, and management.

The Program. Students taking this major receive solid grounding in fundamentals of computer languages, operating systems, and the formal mathematical tools required to use the computer in solving complex tasks. Emphasis in the major is on software, although introductory architecture is included. For students interested in the engineering aspects of computer science, see Engineering: Computer Science.

Career Alternatives. The computer science program prepares students for advanced work in computer science or in other disciplines requiring advanced knowledge of the use of computers.

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	48-49
Computer Science Engineering 30 or 35, 40.....	8
Computer Science Engineering 50.....	4
Mathematics 21A-21B-21C, 22A-22B.....	18
Statistics 32.....	3
One series from the following four.....	15-16
(a) Chemistry 2A-2B-2C	
(b) Chemistry 2A-2B and Biological Sciences 1A	
(c) Chemistry 2AH-2BH-2CH	
(d) Physics 9A-9B-9C and Mathematics 21D	
Depth Subject Matter	53-55
Computer science, core courses.....	29
Computer Science Engineering 100, 110, 120, 122A, 140A, 150† or 151A†.	
Computer Science Engineering 154A-154B.	
Computer science electives.....	14
Minimum of 14 units from Computer Science Engineering 122B, 140B, 150, †151A, †142, 151B, 152, 158, 160, 163, 165A, 165B, 168, 170, 172, 175, 199 (maximum 3 units and departmental approval required), Electrical and Computer Engineering 180A, 180B, Mathematics 160, ‡164‡.	
Upper division mathematics.....	10-12
Mathematics 108, and one course from Mathematics 115A, 115B, 115C, 125, 127A, 127B, 127C, 131 (or Statistics 131A), 141, 145, 147, 149A, 149B, 150A, 150B, 150C; one upper division Mathematics course numbered below 188.	
Total Units for the Major	101-103

† Completion of only 150 or 151A will satisfy the core requirement, but not a computer science elective simultaneously.

‡ Completion of Mathematics 160 and/or 164 will satisfy either a computer science elective or a mathematics elective, but not both requirements simultaneously.

Major Advisers. S. Alvarado, N. Matloff, R. Olsson, R.F. Walters.

Minor Program Requirements

	UNITS
Computer Science	24
Computer Science Engineering 50.....	4
Computer Science Engineering 110.....	4
Upper division Computer Science Engineering.....	16
Any courses chosen from the following list: Computer Science Engineering 120, 122A, 122B, 140A, 140B, 142, 150, 151A, 151B, 152, 154A, 154B, 158, 160, 163, 165A, 165B, 168, 170, 172, 175, 189A-L.	

Graduate Study. See the Graduate Studies section in this catalog.

Computer Science (A Graduate Group)

Charles U. Martel, Ph.D., Chairperson of the Group
Group Office, 2063 Engineering II (Department of Computer Science) (916-752-7004;
gradinfo@cs.ucdavis.edu)

Faculty. Consists primarily of faculty members from the Department of Computer Science, the Department of Electrical and Computer Engineering, the Department of Applied Science (Livermore), the Department

of Mathematics, and the Graduate School of Management.

Graduate Study. The Graduate Group in Computer Science offers programs of study leading to the M.S. and Ph.D. degrees in Computer Science. The varied nature of the faculty brings a wide variety of research interests to the program. Research strengths lie in algorithms, artificial intelligence, computer architecture, computer graphics, computer systems design, database systems, computer security, computer networks, fault tolerance, natural language processing, cognitive science, numerical analysis, program specifications and verification, programming languages, parallel and distributed systems, operating systems, performance evaluation, robotics, scientific computation, and software engineering. Interdisciplinary research in computer science is encouraged.

Preparation. Normal preparation for the program is a bachelor's degree in either computer science or in a closely related field (such as electrical engineering or mathematics, with substantial course work in computer science). Applications are also considered from students with outstanding records in other disciplines. M.S. students may either complete a thesis or pass written examinations in three areas of specialization as defined by the Graduate Group. Ph.D. candidates must pass preliminary written examinations in three areas of specialization as defined by the Graduate Group. The candidates must also pass a qualifying oral examination and complete a dissertation demonstrating original research in an area approved by the Graduate Group.

Graduate Advisers. N.S. Matloff, N. Max, B. Mukherjee.

Conservation Biology

See Ecology (A Graduate Group); Environmental Biology and Management; and Wildlife and Fisheries Biology

Consumer Economics

(College of Agricultural and Environmental Sciences)
Faculty. See under Department of Agricultural Economics.

Major Program and Graduate Study. See the major in Agricultural and Managerial Economics; and for graduate study, see the Graduate Studies section in this catalog.

Related Courses. See Agricultural Economics.

Courses in Consumer Economics (CNE)

Questions pertaining to the following courses should be directed to the instructor or to the Department of Agricultural Economics, Advising Office, University House Annex.

Upper Division Courses

142. Personal Finance (3) I. Shepard; II. B. Butler; summer
Lecture—3 hours. Prerequisite: Economics 1B. Management of income and expenditures by the household. Use of consumer credit, savings, and insurance by households. Principles of tax, retirement, and estate planning. (Same course as Agricultural Economics 142.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Graduate Courses

290. Seminar (1) I, II, III. The Staff Seminar—1 hour. Current issues in consumer economics and the economics of consumption.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Consumer Science

(College of Agricultural and Environmental Sciences)

Faculty. See under the Division of Textiles and Clothing.

Major Programs and Graduate Study. Consumer Food Science is a related major. For graduate study, see the Graduate Studies section in this catalog.

See Consumer Economics, Food Science and Technology, Nutrition, and Textiles and Clothing.

Courses in Consumer Science (CNS)

Questions pertaining to the following courses should be directed to the Division of Textiles and Clothing Advising Office, 129 Everson Hall.

Lower Division Courses

47. Food Product Development Field Study (1) III. Schutz

Discussion—three 2-hour sessions; field trip—2 days. To observe commercial aspects of the large-scale development, distribution and evaluation of food products intended for human consumption. Course given between Winter and Spring Quarters. Advance enrollment with instructor required Winter quarter. (P/NP grading only.)

92. Internship in Consumer Science (1-12) I, II, III. Rucker

Internship—3-36 hours. Prerequisite: consent of instructor. Internship on and off campus in a consumer science related area. (P/NP grading only.)

Upper Division Courses

100. Consumer Behavior (3) I. Rucker

Lecture—3 hours. Prerequisite: preparation in areas of psychology or sociology and economics recommended. Provides a set of behavioral concepts and theories useful in understanding consumer behavior on the part of the individual, business, and social organizations. Conceptual model to help guide and understand consumer research will be presented. General Education credit: Contemporary Societies.

192. Internship in Consumer Science (1-12) I, II, III. Rucker

Internship—3-36 hours. Prerequisite: completion of a minimum of 84 units; consent of instructor. Internship on and off campus in a consumer science related area. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. Rucker (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. Rucker (P/NP grading only.)

Graduate Course

299. Research (1-12) I, II, III. Rucker (S/U grading only.)

Critical Theory

Marc E. Blanchard, Agrégé de Lettres, Program Director (916-752-4787)

Program Office, 516 Sproul Hall, (916-752-5464)

Committee in Charge

Phil Barrish, Ph.D. (*English*)

Marc E. Blanchard, Ph.D. (*French, Critical Theory*)

M. Kay Flavell, Ph.D. (*Humanities Program, Critical Theory*)

Ruth Frankenberg, Ph.D., (*American Studies*)

Smadar Lavie, Ph.D. (*Anthropology, Critical Theory*)

Harriet Murav, Ph.D. (*Russian*)

Irit Rogoff, Ph.D. (*Art, Critical Theory*)

Juliana Schiesari, Ph.D. (*Italian*)

Michael Smith, Ph.D. (*Applied Behavioral Sciences*)

Georges Van Den Abbeele, Ph.D. (*French*)

Graduate Study. The program in Critical Theory offers study and research leading to the Ph.D. with a *designated emphasis* in Critical Theory. The program provides theoretical emphasis and interdisciplinary perspective to students already preparing for the Ph.D. in one of the eleven participating departments (Anthropology, Comparative Literature, Education, English, French and Italian, German and Russian, History, Music, Philosophy, Psychology, Sociology, and Spanish; other departments are in the process of joining). Students complete all requirements for the Ph.D., including the dissertation, in one of the participating departments. The additional requirements leading to the designated emphasis consist of two core courses (200A, 200B) offered by the program in Critical Theory, two additional graduate courses (one of which may be Critical Theory 201), and a special examination.

Graduate Adviser. Consult Critical Theory Program Office.

Courses in Critical Theory (CRI)

Graduate Courses

200A. Approaches to Critical Theory (4) I, II. The Staff

Lecture/discussion—4 hours. Prerequisite: graduate standing in a participating program. Investigation into research problems of Critical Theory and a critical examination of various theoretical approaches (e.g., semiotics, hermeneutics, deconstruction, social and cultural critique, feminist theory, psychoanalysis) in an interdisciplinary perspective.

200B. Problems in Critical Theory (4) I, II, III. The Staff

Seminar—3 hours; term paper. Prerequisite: course 200A with a grade of B+ or better. Practical application of critical theoretical perspectives to a common problem defined in interdisciplinary terms. Topics will vary.

201. Critical Theory Special Topics (4) I, II, III. The Staff

Seminar—3 hours; term paper. Prerequisite: course 200A. Application of theoretical principles to one specific research topic.

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Dermatology

See Medicine, School of

Design

(College of Agricultural and Environmental Sciences)

Faculty. See under the Department of Environmental Design.

The Major Program

The design program offers a creative, challenging, and flexible approach to the study of design. The philosophy of the program encourages self-direction and creativity, not only in design work but also in planning the overall undergraduate education.

The Program. Basic introductory design courses such as introduction to design, drawing, and media are required of all design majors. Beyond these, students take specialized courses in their area of interest. A student who emphasizes costume design, for example, might have a study plan that includes courses in photographic media, personal adornment, history of costume design, and the upper division studio costume design series. Textile design students take courses in hand-constructed, layered, and loomed textiles, as well as the printed textile design series. Environmental design is an area that includes courses in drafting and perspective, exhibit design, furniture design, and the two-year studio interior design series. These areas are strongly complemented by classes in related design history.

Portfolio. Students will be required to keep a continuing portfolio of their creative work to be evaluated by faculty for the purposes of declaring the major, enrolling in overflow courses, and requesting independent study, internship, or other similar courses.

Internships and Career Alternatives. As part of their preparation, design students are encouraged to become involved in internships in design firms, museums, art galleries, textile galleries, and in interior designers' and architects' offices. Design graduates have gone directly from this program into retail clothing and interior design and architectural firms, exhibit and display work in galleries and museums, and theatrical and textile companies. In addition, students also create their own jobs through freelance and commission work in many related areas.

B.S. Major Requirements:

UNITS

English Composition Requirement0-8
See College requirement

Preparatory Subject Matter32-34
Art (one course from Art History 1A, 1B, 1C or 1D).....4

Design (Design 1, 3, 11, 12, 13)20

Other (two courses from American Studies 10, Anthropology 2, Geology 2, Psychology 1, Sociology 1, 25, Rhetoric and Communication 1, 3)7-9

Breadth/General Education32

Satisfaction of General Education requirement to include 16 units in natural science and/or Nature and Environment and 16 units in social science and/or Contemporary Societies.....32

Depth Subject Matter48

Design history, select from Design 140, 142A, 142B, 143, 14412

Design, selected with adviser's approval..12

Design, upper division courses24

Restricted Electives21

(Courses to be selected with approval of adviser.)

Unrestricted Electives25-28

Total Units for the Degree180

Additional Requirement

Development of a course of study, in consultation with an adviser, no later than the second quarter of the junior year.

Major Adviser. J. Stabb.

Courses in Design (DES)

Questions pertaining to the following courses should be directed to the instructor or to the Advising Center for the major, 152 Walker Hall (916-752-1165).

Lower Division Courses

1. Design and Visual Culture (4) I. Hethorn
Lecture—4 hours. Introduction to design awareness; role of designer in contemporary culture; emphasis on visual literacy and perception, creative problem solving, and design culture.

3. Fantasy Design (4) III. Gotelli
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2. Investigation of fantasy as found in the environment. All aspects of design are explored and fantasy is presented as a problem-solving device.

11. Drawing Studio (4) I. The Staff (Stabb in charge)
Studio—8 hours. Prerequisite: course 1 must be taken concurrently; priority enrollment to Design majors. Drawing for the designer as an aid to perception and communication of ideas, objects, and plans. May be repeated once with a different instructor (course 1 should not be repeated).

12. Media Studio (4) II. Palmer and staff
Studio—8 hours; field trip. Prerequisite: course 2 must be taken concurrently; priority enrollment to Design majors. Tools, materials, and techniques used in the designer's studio.

13. Photographic Media Studio (4) III. The Staff (Stabb in charge)
Studio—8 hours. Prerequisite: course 1 or 2; course 3 must be taken concurrently; priority enrollment to Design majors. Film and video tape for description, simulation, analytical research, and design development.

21. Drafting and Perspective (4) I. Olsen and staff
Studio—8 hours. Prerequisite: course in drawing recommended. Creation of three-dimensional designs on two-dimensional surfaces.

22. Basic Imagery (4) I. The Staff (Stabb in charge)
Studio—8 hours. Prerequisite: courses 11, 12. Presentation of the fundamentals of designed images, combining a theoretical perspective with practice using the components of visual literacy. Specific focus upon (1) abstract structure, (2) symbolism, and (3) representation.

***23. Personal Adornment (4) I.** Stabb
Studio—8 hours; field trip. Exploration of the human image altered through ornament and its relation to the human structure.

24. Hand Constructed Textiles (4) I. Laky
Studio—8 hours; one or two field trips. Prerequisite: courses 11, 12. Contemporary approach to textile techniques of construction such as netting, plaiting, knotting and basketry.

25. Reproduction Graphics (4) II. The Staff (Stabb in charge)
Studio—8 hours; field trip. Prerequisite: courses 11 or 12, and 13. Basic studio and photographic skills for the designer; continuous tone, line and halftone films, mechanical and four-color screen separations.

77A. Soft Product Development (4) II. Hethorn
Studio—8 hours. Prerequisite: course 11 or 12 recommended. Basic theories and principles of soft product development from two-dimensional shapes to three-dimensional forms. Approaches include flat pattern, draping, as well as processes of joining and building. Structural development of clothing in relation to bodies is emphasized.

77B. Soft Product Development (4) III. The Staff (Stabb in charge)
Studio—8 hours. Prerequisite: course 77A. Study and practice of designing clothing for the human body through pattern development and structural joining sequences. Problems emphasize advanced theories and principles of soft product development.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Stabb in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

121. Design Delineation (4) II. The Staff (Stabb in charge)
Studio—8 hours; field trip. Prerequisite: courses 11, 12, and 21. Exploration of the process of delineation, including principles of perspective drawing, rapid visualization techniques (the quick sketch), rendering, and graphic presentation methods.

124. Textile Structures (4) III. Laky
Studio—8 hours; field trip. Prerequisite: course 23 or 24. Art and science of hand building structures in flexible materials. Studio projects in experimental two- and three-dimensional forms with some emphasis on relationships to architecture, furniture and interiors.

***125. Textiles in the Landscape (4) III.** The Staff (Stabb in charge)
Lecture—2 hours; studio—5 hours. Prerequisite: courses 21, 22, 24. Structuring organic and mathematical forms in textiles, working with the symbiotic relationship of these textiles and their immediate placement in the outdoor landscape.

126A. Visual Presentation: Visual Merchandising (4) I. Gotelli
Studio—8 hours; field trips. Prerequisite: course 11, 12 or consent of instructor. Principles and practice of visual communication of ideas through non-verbal presentations. The study of three-dimensional objects in a spatial context with an emphasis on visual merchandising.

126B. Visual Presentation: Exhibition Design (4) II. Gotelli
Studio—8 hours; field trips. Prerequisite: course 11, 12 or consent of instructor. Principles and practice of visual communication of ideas through non-verbal presentations. The study of three-dimensional objects in a spatial context with an emphasis on the museum and gallery environment.

126C. Visual Presentation: Installation and Design (4) III. Gotelli
Studio—8 hours; required field trips. Prerequisite: courses 126A and 126B. Advanced principles and practice of visual communication of ideas through non-verbal presentations. The study of three-dimensional objects in a spatial context with an emphasis on self-expression and alternative exhibition spaces.

131. Layered Textiles and Costumes (4) III. The Staff (Stabb in charge)
Studio—8 hours; field trip required. Prerequisite: courses 11, 12, 23, and 24 recommended. Exploration of surface embellishments and structural techniques derived from historic and contemporary world cultures. Emphasis on unique qualities of hand made textiles/costumes and individual expression. Topics included mola and applique, piecing and quilting, beadwork, embroidery, and dimensional surfaces. Offered in alternate years.

132A. Loom-Constructed Textile Design (4) I. The Staff (Stabb in charge)
Studio—8 hours. Prerequisite: course 23 or 24. Foundation course in handwoven textile structure and design, emphasizing yarn identification, basic drafting, basic weaves and their derivatives explored in context of original color effects and yarn combinations.

132B. Loom-Constructed Textile Design (4) II. The Staff (Stabb in charge)
Studio—8 hours. Prerequisite: course 132A. Intermediate level study of complex fabric structure with emphasis on pattern in relation to surface, dimension, and material.

***132C. Computer-Aided Textile Design (4) III.** The Staff (Stabb in charge)
Studio—8 hours. Prerequisite: course 132B. Micro-computer applications to the structure, design, and weaving of fabrics, emphasizing advanced compositions, drafting, and plotting of multi-dimensional, original weave structures.

133A-133B. Visual Metaphor (4-4) II-III. Butler
Studio—8 hours. Prerequisite: courses 13, 22, 25. Study and practice of image generation and production with emphasis on clarity of visual expression, the perception and use of color, and visual composition in the three-dimensional context.

134A. Fundamentals of Interior Architecture (4) I. Harrison and staff (Stabb in charge)
Studio—8 hours. Prerequisite: courses 11, 12, 13, and 21 and junior standing. Introduction to design process through simple space planning problems focused on residential and small commercial installations.

134B. Fundamentals of Interior Architecture (4) II. Berteaux and staff
Studio—8 hours. Prerequisite: course 134A. Problems emphasize energy considerations, structure, building systems, and architectural harmony in the urban environment.

134C. Fundamentals of Interior Architecture (4) III. Harrison and staff (Stabb in charge)
Studio—8 hours. Prerequisite: course 134B. Problems emphasize the design of special and technical environments such as laboratories, medical facilities, and computer installations and environments for the handicapped, aged, and very young.

135. Furniture Design (4) II. The Staff (Stabb in charge)
Studio—8 hours; one or two field trips. Prerequisite: course 21; course 180A recommended. Development of furniture for interior and exterior spaces. Includes behavioral and physical requirements; cultural and historical expression; structural and aesthetic considerations.

140. History of Design (4) II. The Staff (Stabb in charge)
Lecture—4 hours. Prerequisite: Art History 1A or the equivalent. Historical survey of the changing relationship of society to its practices and techniques of making and using tools and objects; technological changes, development of design terminology, consumer goods, hand workmanship, and industrial design.

142A. World Textiles: Far East and Pacific (4) I. The Staff (Stabb in charge)
Lecture—4 hours, field trip. Prerequisite: courses 132A, 132B, 160A, or 170A (concurrently) highly recommended: course 1, Art History 1A, 1B, or 1C also recommended. Textile arts of Japan, China, Africa, India, Oceania, Indonesia, and the Pacific Islands with emphasis on the aesthetic and stylistic qualities of textiles from these cultures.

142B. World Textiles: Middle East, Europe and the Americas (4) III. Laky
Lecture—4 hours; two field trips. Prerequisite: course 1; a studio class highly recommended: course 24, 124, 131, 132A, 132B, 160A-160B-160C or 170A-170B-170C (concurrently). Study of concepts and methods significant in the historical, social, esthetic and stylistic development of the textile arts.

143. History of Costume Design (4) II. Stabb
Lecture—4 hours; field trip. Prerequisite: course 140. History of costume design from the earliest times to the present with emphasis on both aesthetic and functional aspects.

144. History of Interior Design (4) III. The Staff (Stabb in charge)
Lecture—4 hours. Prerequisite: course 140 and Art 1C or the equivalent. History of interior design in Europe and America from the classical period to modern times. Emphasis on the dwelling in its cultural setting and the development of the theory of modern interior design.

160A. Textile Design: Patterning and Resists (4) I. Rivers
Studio—8 hours. Prerequisite: courses 1, 11, 12 or the equivalent. Open to senior majors in Design and Textiles and Clothing. Exploration of the design, dyeing and patterning of hand-printed textiles; emphasis on the unique qualities of the individual producer. Techniques include tie-dye, direct dyeing (with fiber-reactive dyes and indigo) and batik resists.

160B. Textile Design: Screen Printing and Advanced Technique (4) II. Rivers
Studio—8 hours. Prerequisite: course 160A. Open to senior majors in Design and Textiles and Clothing. Exploration of the design, dyeing and patterning of hand-printed textiles; emphasis on the unique qualities of the individual producer. Techniques include

silk screen printing, photo-silkscreen, and advanced dyeing processes.

170A. Costume Design (4) I. Stabb

Studio—8 hours; required field trip. Prerequisite: courses 1, 11, 12, 77B (or the equivalent); course 142A taken concurrently recommended. Open to Design and Textiles and Clothing majors. Exploration of costume design as an expression of contemporary and projected individual image. Emphasis on one-of-a-kind garments in relationship to surface design and archetypal forms.

170B. Apparel Design (4) II. Stabb

Studio—8 hours; required field trip. Prerequisite: courses 77B, 170A. Exploration of apparel design processes for industry within the social and physical context. Emphasis on two-dimensional conceptualization of ideas utilizing commercial textiles for ready-to-wear.

177. Apparel Design for Consumer Cultures (4)

Hethorn

Studio—8 hours. Prerequisite: course 170B. Principles and processes of designing apparel for various user groups. The relationship among clothing, the body, and the environment is addressed in meeting functional and aesthetic concerns.

180A. Advanced Interior Architecture (4) I. Olsen, Berteaux

Studio—8 hours; field trip. Prerequisite: course 134C and senior standing. Advanced problems in interior architectural design emphasizing re-use of existing buildings. Focus is on commercial and retail environments, code requirements, color and lighting.

180B. Advanced Interior Architecture (4) II.

Harrison and staff

Studio—8 hours; field trip. Prerequisite: course 180A. Advanced problems in interior architectural design emphasizing space planning for corporate and institutional environments.

180C. Senior Project in Interior Architecture (4) III. Berteaux

Studio—8 hours; field trip. Prerequisite: course 180B. Design of a complex facility, including the integration of interior design, building structure and building systems.

190. Proseminar (1) II, III. Berteaux

Seminar—1 hours. Prerequisite: design major or consent of instructor. Philosophies of design explored through discussion and presentation of research results. May be repeated three times for credit. (P/NP grading only.)

191A-D. Workshops in Design (4-12) I, II, III. The Staff (Stabb in charge)

Seminar—1 hour; studio or field experience—3 hours per unit (units determined by instructor and student); field trip. Prerequisite: course 11, 12; upper division standing and consent of instructor. Faculty initiated workshops featuring advanced studies and applications of original work in Design: (A) Costume; (B) Environment; (C) Graphics; (D) Textiles. Credit limited to 12 units in one section or a combination of sections. Letter grading by contract.

192. Internship (1-6) I, II, III summer. The Staff (Stabb in charge)

Internship—3–18 hours. Prerequisite: completion of 84 units and consent of instructor. Supervised internship, off and on campus, in areas of design including environmental, costume, textile, museum, display and interior design. Enrollment limited to 3 units per quarter or 6 units per summer session. (P/NP grading only.)

197T. Tutoring in Design (1-5) I, II, III. The Staff (Stabb in charge)

Discussion—3–15 hours. Prerequisite: upper division standing and consent of instructor. Leading of small discussion groups or studio meetings affiliated with one of the department's regular courses. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Stabb in charge)

Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

199. Special Study of Advanced Undergraduates (1-5) I, II, III. The Staff (Stabb in charge) (P/NP grading only.)

Graduate Courses

290. Seminar in Design (4) I, II, III. The Staff (Rivers in charge)

Seminar—4 hours. Prerequisite: graduate standing or consent of instructor. Selected topics in design methodology, research, communication, and education. May be repeated for credit.

298. Directed Group Study for Graduate Students (1-5) I, II, III. The Staff (Rivers in charge)

Studio—variable hours. Prerequisite: consent of instructor. (S/U grading only.)

299. Directed Individual Study for Graduate Students (1-5) I, II, III. The Staff (Rivers in charge)

Studio—variable hours. Prerequisite: consent of instructor. (S/U grading only.)

Dietetics

(College of Agricultural and Environmental Sciences)

The Major Program

The dietetics major provides students with training in normal and therapeutic nutrition, biological and social sciences, food science, communication, and management. This major fulfills the academic requirements for admission into a dietetics internship or the equivalent which must be completed before qualifying for registration as a dietitian.

The Program. The dietetics major takes the same basic core of nutrition classes as nutrition science majors, but in dietetics there is less emphasis on laboratory aspects of the science courses. Instead, dietetics majors take additional courses such as education, sociology, communication skills, and food service management to prepare for work with the public. Dietetics students spend the first two years completing preparatory course work in the basic biological sciences, along with several of the social sciences. In the final two years, students take courses in normal and clinical nutrition, food science, biochemistry, and management techniques.

Career Alternatives. The dietetics major qualifies students to apply for the American Dietetics Association "accredited internship," enabling them to become a Registered Dietitian, the professional credential necessary to work in a clinical setting. Once dietitians are registered, they generally seek employment in administrative, therapeutic, teaching, research, or public health/public service positions in clinics, hospitals, schools, or other similar institutions. There is a growing role for dietitians working in settings outside of the traditional hospital (for example, in state and federal nutrition programs, nutrition education, Peace Corps and Cooperative Extension work). Students who complete the undergraduate preparation in dietetics are also qualified to enter graduate programs in dietetics, nutrition science, public health nutrition, and food service management.

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

UNITS

English Composition Requirement0-8
See College Requirement

Preparatory Subject Matter52-53

Biological sciences (Biological Sciences

1A, 1B)10

Chemistry (Chemistry 2A, 2B, 8A, 8B)16

Computer science (Agricultural Systems and Environment 21 or Computer Science Engineering 10 or 15)3-4
Economic principles (Economics 1A or 1B) ...5
Microbiology (Microbiology 102, 102L)6
Psychology (Psychology 1)4
Social science theory (Sociology 1 or 3 or Anthropology 2)4-5
Statistics (Statistics 13)4

Breadth/General Education6-24

Satisfaction of General Education requirement6-24

Depth Subject Matter71

Agricultural Economics 1124

Applied Behavioral Sciences 173 or Education 1104

Biological chemistry (Biological Sciences 102 and 103)6

Food Science and Technology 100A, 100B, 101A, 101B10

Food Service Management 120, 120L, 121, 122, 12314

Nutrition 110, 111, 113, 116A, 116AL, 116B 116BL, 118, 19026

Physiology (Neurobiology, Physiology and Behavior 110, 110L)7

Unrestricted Electives23-43

Total Units for the Major180

Major Adviser. A.J. Clifford (*Nutrition*).

Advising Center for the major is located in 1151 Meyer Hall (916-752-2512).

Graduate Study. See the Graduate Studies section in this catalog.

Dramatic Art

(College of Letters and Science)

Robert A. Fahrner, Ph.D., Chairperson of the Department

Department Office, 222 Dramatic Art Building
(916-752-0888)

Faculty

Robert A. Fahrner, Ph.D., Professor
Harry C. Johnson, M.A., Professor
Jeffrey Hunt, M.F.A., Assistant Professor
William E. Kleb, D.F.A., Professor
Phyllis J. Kress, M.F.A., Lecturer
Barbara Sellers-Young, Ph.D., Assistant Professor
Darrell F. Winn, M.A., Lecturer

Emeriti Faculty

Ruby Cohn, Ph.D., Professor Emerita
Everard d'Harnoncourt, Ph.D., Professor Emeritus
Robert K. Sarlós, Ph.D., Professor Emeritus
Daniel E. Snyder, Professor Emeritus
Alan A. Stambusky, Ph.D., Professor Emeritus

The Major Program

The Department of Dramatic Art offers students an opportunity to develop their talents and abilities through a broad spectrum of courses combining both artistic and scholarly skills. The dramatic art student is exposed to every phase of theatre: the performing areas such as acting, directing, design, and playwrighting; technical practice involving construction and coordination of sets, costumes, and lights; and a firm grounding in theatre history, dramatic literature, and criticism.

Productions and Facilities. Productions each year are separated into three "seasons." The University Theatre Season consists of five major productions of established plays. Five smaller productions of new, student-written plays form Premiere Season, while Studio Season offers three smaller productions of established plays. Also included in the production program are one major presentation of an experimental piece and many class-related projects.

Guest Artists. The department's Granada Artists-in-Residence program brings distinguished British theatre artists to the department each quarter to teach and direct.

Career Alternatives. The various skills involved in a rounded theatre education open doors to many career possibilities. Arts management is a relatively new area calling for people with artistic training. Designers and technicians will find career opportunities in community theatres, amusement parks, museums, lighting firms, the fashion industry, and advertising. Training in acting helps those interested in pursuing law, business, public relations, or public office. And there are always those few who—with talent and luck—succeed as actors, directors, or designers for stage, film, or television.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	22
Dramatic Art 20, 21A, 24, 25	14
Dramatic Art 21B or 27	3-4
Additional units to achieve a total of 22 lower division units in Dramatic Art	4-5
Depth Subject Matter	40
Dramatic Art 124A or 124B, 124C or 124D, 127A, 127B or 160B, 156, 157, 158, 159, 160A	36
A minimum of 4 elective units chosen from the following: Dramatic Art 115, 121A, 121B, 124C, 124D, 126, 150, 153, 155; or, with the adviser's consent, from appropriate literature courses in language and literature departments	4
Additional Requirements	
During the undergraduate career majors are to participate in at least eight dramatic productions (exclusive of classroom projects). Participation must include work in acting, scene construction, costume construction, lighting, and stage managing or directing. Majors are also expected to attend theatre performances.	
Total Units for the Major	62

Minor Program Requirements:

	UNITS
Dramatic Art	20
Dramatic Art 124A, 160A, 156, 157 or 158, 159	20

Major Advisers. J. Hunt, H. Johnson.

Transfer Students. If you are a transfer student you should see the major adviser for an evaluation of your experience.

Teaching Credential Subject Representative. E. Carlin. See also the Teacher Education Program.

Graduate Study. The Department of Dramatic Art offers programs of study and research leading to the M.A., M.F.A. (acting, design, directing, or play writing), and Ph.D. (theatre research) degrees. Detailed information may be obtained by contacting the Graduate Adviser.

Graduate Adviser. W.E. Kleb.

Courses in Dramatic Art (DRA)

Lower Division Courses

10. Introduction to Acting (3) I, II, III. The Staff
Lecture/discussion—4 hours; term paper. Fundamentals of movement, speech, theatre games, and improvisation. Selected reading and viewing of theatre productions. Intended for students not specializing in Dramatic Art.

20. Introduction to Dramatic Art (4) I, III. The Staff
Lecture—3 hours; discussion—1 hour. Understanding and appreciation of both the distinctive and collaborative contributions of playwright, actor, director, and designer to the total work of dramatic art. Study of plays from the major periods of dramatic art in their cultural contexts.

21A. Fundamentals of Acting (4) II. Sellers-Young
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 20. Physical and psychological resources of the actor. Experience in individual and group contact and communication, theatre games, advanced improvisation, sound and movement dynamics. Viewing of theatre productions. Limited to those planning to major in Dramatic Art.

21B. Fundamentals of Acting (4) III. Sellers-Young
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 21A and consent of instructor. Theory and practice of acting with emphasis on character analysis, interpretation, and development. Acting in a student-directed project. Viewing of theatre productions. Limited to those planning to major in Dramatic Art.

24. Visual Aspects of Dramatic Art (4) III. The Staff
Lecture—3 hours; laboratory—2 hours. Understanding and appreciation of the visual aspects of dramatic art: theatre architecture, scenery, lighting, costume, and makeup.

25. Technical Aspects of Dramatic Art (2) II. Winn
Lecture—1 hour; laboratory—2 hours. Understanding and appreciation of the technical principles of dramatic production; basic tools and materials, principles of scene construction: scene painting, costume construction, stage rigging, lighting and sound equipment and control systems.

***27. Fundamentals of Playwriting and Directing** (3) I. Kleb
Discussion—2 hours; workshop—2 hours; reading of selected texts in the theory of directing and playwriting. Prerequisite: consent of instructor. Exercises in conceiving and developing theatre pieces with emphasis upon the creative collaboration of playwright and director.

30. Theatre Laboratory (1-5) I, II, III. The Staff
Prerequisite: course 25 or consent of instructor. Projects in acting, production, scene design, costuming, lighting, directing, and playwriting. Participation in departmental productions. May be repeated for credit up to a total of 8 units.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

***115. Advanced Study of Major Film Makers** (4) II. The Staff
Lecture/discussion—3 hours; film viewing—2 hours. Prerequisite: course 15. Analysis of the contribution of some outstanding film creators. Study of diverse aesthetic theories of the cinema and their application to selected films. May be repeated for credit when different film creator studied.

121A. Advanced Acting (4) I. Johnson
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 21B and consent of instructor. Theory and practice of acting focusing on performance problems and the maximization of individual resources.

121B. Advanced Acting (4) II. The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 121A and consent of instructor. Theory and practice of acting focusing on performance problems and the maximization of individual resources.

124A. Principles of Theatrical Design: Scenery (4) I. J. Hunt
Lecture-seminar—4 hours. Prerequisite: course 24 or consent of instructor. Scene design processes, working drawings, sketching techniques, scale models, methods and materials of scenery construction.

124B. Principles of Theatrical Design: Scenery (4) II. J. Hunt
Lecture-seminar—4 hours. Prerequisite: course 24 or consent of instructor. Analysis of plays in terms of scene design, elements of design, execution of designs for modern and period plays.

124C. Principles of Theatrical Design: Lighting (4) III. Winn
Lecture-seminar—4 hours. Prerequisite: course 24 or consent of instructor. Theories of lighting the stage, equipment and control systems, execution of lighting plots.

124D. Principles of Theatrical Design: Costume (4) II. Kress
Lecture-seminar—4 hours. Prerequisite: course 24 or consent of instructor. Source materials for theatrical costuming, selecting fabrics, elements of design, analysis of plays in terms of costume design, execution of designs for modern and period plays.

126. Production Management (3) II. Winn
Lecture—3 hours. Prerequisite: course 25. Theoretical study of backstage operation from audition through performance: techniques of stage management, technical direction, cueing procedures and audience control. Offered in alternate years.

127A. Principles of Directing (4) I. The Staff
Lecture—2 hours; laboratory—4 hours; rehearsal. Prerequisite: courses 21A, 21B, or 27; 156, 157, 158, or consent of instructor. The director's creative approach to the play and to its staging.

***127B. Principles of Directing** (4) II. The Staff
Lecture—2 hours; laboratory—4 hours; rehearsal. Prerequisite: course 127A and consent of instructor for non-majors. The director's creative approach to the actor.

***150. American Theatre and Drama** (4) II.
Lecture—4 hours. The history of the theatre from Colonial times to the present. Readings of selected plays. Offered in alternate years.

***153. The American Musical** (4) III. Kleb
Lecture—4 hours. History and development of the American Musical as a unique theatrical form. Offered in alternate years.

***154. Asian Theatre and Drama: Contexts and Forms** (4) II. Sellers-Young
Lecture/discussion—4 hours. Prerequisite: upper division standing. Selected Asian plays and performance forms in their cultural and artistic contexts; myth, ritual and the theatre; performance training, visual presentation of the text; political theatre; intercultural performance—the fusion of Asian and Western traditions. Offered in alternate years.

***155. Black Theatre and Drama** (4) III. Johnson
Lecture—4 hours. Black Theatre and drama today: the history, impact and current direction of the work of Blacks in the theatre. Offered in alternate years.

156. Theatre and Drama: Aeschylus to Machiavelli (4) I. The Staff
Lecture—4 hours. Selected plays and the history of the theatre from ancient Greece through the Italian and Spanish Renaissance. General Education credit: Civilization and Culture.

157. Theatre and Drama: Shakespeare to Schiller (4) II. The Staff
Lecture—4 hours. Selected plays and the history of the theatre from the English Renaissance through German and French Romanticism. General Education credit: Civilization and Culture.

158. Theatre and Drama: Ibsen to Albee (4) III. Fahrner
Lecture—4 hours. Selected plays and the history of the theater from English Romanticism to the present.

159. Contemporary Experimental Theatre and Drama (4) I. Kleb
Lecture—4 hours. Examination and evaluation of the "New Theatre." Course includes attending theatre events.

160A-160B. Principles of Playwriting (4-4) I-II. Kleb
Lecture/seminar—4 hours. Prerequisite: two courses in Dramatic Art or related courses in other departments. Analysis of dramatic structure; preparation of scenarios; the composition of plays.

180. Theatre Laboratory (1-5) I, II, III. The Staff
Prerequisite: upper division standing and course 25, or consent of instructor. Projects in acting, production, scene design, costuming, lighting, directing, and playwriting. Participation in departmental productions. May be repeated for credit.

192. Internship in Dramatic Art (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: upper division or graduate work in dramatic art; upper division course related to the project; consent of instructor and Department Chairperson. Internship outside the academic department enabling students to practice their skills. May be repeated for credit for a total of 12 units. (P/NP grading only.)

194HA-194HB. Special Study for Honors Students (3-3) I, II, III. The Staff

Independent study—9 hours. Prerequisite: qualification for Letters and Science Honors Program and admission to Dramatic Art Senior Honors Program. Preparation and presentation of a culminating project, under the supervision of an instructor, in one of the creative or scholarly areas of Dramatic Art. (Deferred grading only, pending completion of sequence).

197T. Tutoring in Dramatic Art (1-5) I, II, III. The Staff (Chairperson in charge)
Tutoring—1-5 hours. Prerequisite: upper division or graduate standing with major in dramatic art; consent of department chairperson. Leading of small voluntary groups affiliated with one of the department's regular courses. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200. Methods and Materials in Theatre Research (4) I. The Staff
Seminar—3 hours; term paper. Essential research tools in theatre and related fields; bibliographies, primary sources; methods of evaluating and presenting evidence; delineating research areas in the field.

211. Advanced Voice and Speech (2) I, II, III. The Staff
Laboratory—4 hours. Open to advanced undergraduates with consent of instructor. Voice production and speech related to specific acting problems in classical plays, particularly in verse. May be repeated for credit.

212. Advanced Stage Movement (2) I, II, III. Sellers-Young
Laboratory—4 hours. Prerequisite: open to advanced undergraduates with consent of instructor. Rhythmic movement patterns relating to acting problems in classic and modern plays. May be repeated for credit.

221. Special Problems in Advanced Acting (4) I, II, III. Johnson, Sellers-Young
Seminar—2 hours; laboratory—4 hours. Prerequisite: consent of instructor. Advanced acting problems arising from differences in the type and style of plays selected from Greece to the present. May be repeated for credit.

224A. Visual Problems in Theatre and Performance (4) II. The Staff
Seminar—3 hours; term project. Special problems in visual and auditory aspects of theatrical production culminating in a single performance project. Open to Dramatic Art, Art History, Art Studio, and Design majors. May be repeated for credit.

***224B. Advanced Principles and Theories of Theatrical Design** (4) II. The Staff
Seminar—3 hours; term paper. Selected problems in the design of stage scenery and costumes; practice in design. May be repeated for credit.

***224C. Advanced Principles and Theories of Theatrical Design** (4) III. The Staff
Seminar—3 hours; term paper. Design of a production for three different types of theatres: open stage, arena, and proscenium. May be repeated for credit.

***224D. Advanced Principles and Theories of Theatrical Costume Design** (4) III. Kress
Seminar—3 hours; research and design projects—

30 hours (minimum) total. Prerequisite: course 124D or consent of instructor. Costume design projects emphasizing research, principles, and theories; the planning and presentation of costume renderings, detail accessory sketches, and scale drawings of patterns. Projects from classic theatre, musical comedy, ballet, and opera. Offered in alternate years.

***224E. Advanced Principles and Theories of Theatrical Lighting Design** (4) II. Winn
Seminar—3 hours; laboratory—2 hours. Prerequisite: course 124C, a scenic design course, and consent of instructor. Design concepts, script/score analysis, color, composition and style. Projects presented in studio atmosphere. Also included: renderings, written analyses, and drafted plots. Offered in alternate years.

***227. Seminar in Directing Theory: Realism** (4) III. Granada Artist
Seminar—3 hours; term project. Modern directing theory as it applies to theatrical realism; development of directorial concepts for productions of selected realistic plays; emphasis on textual analysis. Offered in alternate years.

***228. Seminar in Directing Theory: Non-Realism** (4) III. Granada Artist
Seminar—3 hours; term paper. Modern directing theory as it applies to non-realistic theatre; development of directorial concepts for production of selected non-realistic plays—Greek to the present; emphasis on textual analysis. Offered in alternate years.

***229. Special Problems in Directing** (5) I, II, III. The Staff and Granada Artist
Seminar—2 hours; laboratory—2 hours; rehearsal—4 hours. Prerequisite: consent of instructor. Projects in directing scenes selected from plays from ancient Greece to the present. May be repeated for credit.

230A-230B. Classic and Medieval Theatre (4-4) II-III. Kleb and staff
Seminar—3 hours; term paper. The theatre of Greece, Rome and Middle Ages; emphasis on relationship of dramas of the period to physical circumstances of production. Course 230A (may be taken separately) includes readings and discussion; 230B emphasizes research culminating in a substantial scholarly paper.

***235A-235B. Renaissance and Baroque Theatre** (4-4) II-III. Fahrner and staff
Seminar—3 hours; term paper. The theatre of Italy, Spain, England, and France, 1500-1660; emphasis on relationship of dramas of the period to physical circumstances of production. Course 235A (may be taken separately) includes readings and discussion; 235B emphasizes research culminating in a scholarly paper.

***240A-240B. Neoclassic and Romantic Theatre** (4-4) II-III. Fahrner and staff
Seminar—3 hours; term paper. The theatre of France, England, Germany, Italy, and America, 1660-1860; emphasis on relationship of dramas of the period to physical circumstances of production. Course 240A (may be taken separately) includes readings and discussion; 240B emphasizes research culminating in a scholarly paper.

***250. Modern Theatre** (4) II.
Seminar—3 hours; term paper. The theatre of Europe and America, 1860-1940, with emphasis on the relationship of the dramas of the period to the physical circumstances under which they were produced. Offered in alternate years.

***259. Contemporary Theatre** (4) I. The Staff
Seminar—3 hours; term paper. Selected aspects of contemporary Western theatre, with attention to their modes of production.

***260. Advanced Playwriting** (4) I, II, III. Volk, Kleb
Seminar—3 hours; term paper. Dramatic structure, character, and dialogue. Advanced projects in playwriting. May be repeated for credit.

***265. Theory of Dramatic Art** (4) II. Kleb
Seminar—3 hours; term paper. Theory and aesthetic principles of dramatic art as a fine art. Offered in alternate years.

280. Theatre Laboratory (1-12) I, II, III. The Staff
Advanced practice in acting, designing, directing, playwriting, and technical theatre. May be repeated for credit.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor.

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

413. Stage Make-up (1) II. The Staff
Lecture/laboratory—2 hours. Prerequisite: consent of instructor. Approved for graduate degree credit. Lectures, demonstrations, and practical work in aspects of theatrical make-up.

Earth Sciences and Resources

See Hydrologic Science; Hydrologic Science (A Graduate Group); and Environmental and Resource Sciences

East Asian Studies

(College of Letters and Science)

Susan Mann, Ph.D., Program Director

Program Office, Interdepartmental Programs (916-752-1219)

Faculty

Beverly Bossler, Ph.D., Assistant Professor (*History*)
Robert Borgen, Ph.D. Professor (*Chinese and Japanese*)

Chia-ning Chang, Ph.D. Assistant Professor (*Chinese and Japanese*)

Mary H. Fong, Ph.D. Professor (*Art History*)
Donald Gibbs, Ph.D., Associate Professor (*Chinese and Japanese*)

Susan Griswold, Ph.D., Assistant Professor (*Chinese and Japanese*)

Whalen W. Lai, Ph.D. Professor (*Religious Studies*)
Susan Mann, Ph.D. Professor (*History*)

Mau-sang Ng, Ph.D., Associate Professor (*Chinese and Japanese*)

Don C. Price, Ph.D., Professor (*History*)
G. William Skinner, Ph.D. Professor (*Anthropology*)

Janet S. Smith, Ph.D., Associate Professor (*Anthropology*)

Marian Ury, Ph.D., Professor (*Comparative Literature*)

Michelle Yeh, Ph.D., Associate Professor (*Chinese and Japanese*)

Emeriti Faculty

Joyce K. Kallgren, Ph.D., Professor Emerita
Kwang-Ching Liu, Ph.D., Professor Emeritus
Benjamin Wallacker, Ph.D., Professor Emeritus

The Major Program

The East Asian studies major is designed to give the student an understanding of East Asia (especially China and Japan) through interdisciplinary studies that combine sustained work in an East Asian language with courses on East Asian cultures.

The Program. The program offers core courses in East Asian history, humanities, social sciences, and languages. After taking the core courses in conjunc-

tion with two years or more of either Chinese or Japanese language study, the student chooses additional courses focusing on a special field of interest, such as anthropology or history. Since six quarters of language work are required, students normally should apply to the East Asian studies program no later than their sophomore year.

Career Alternatives. The program provides preparation either for a career that involves working with East Asian affairs and people (e.g., journalism, business, government service, teaching, and counseling), or as preparation for graduate studies in the East Asian field.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	41-42
History 9A, 9B.....	8
One course from Art History 1D, Chinese 10, 11, Comparative Literature 53A, History 90A, Japanese 10, 25, Religious Studies 70, 75	3-4
Two years (or the equivalent) of Chinese or Japanese language study (Chinese 1-2-3-4-5-6; Japanese 1-2-3-4-5-6).....	30

Depth Subject Matter**36**
Must include at least 8 units of core courses from each of the following categories: history, social science, and humanities. Core courses in each category are listed below.

History:

History 191A, 191B, 191C, 191D, 191E, 191F; 194A-194B or 194B-194C

Social Science:

Anthropology 148A, 148B, 149A, 149B
Economics 171
*Geography 127
Political Science 148A, 148B
*Sociology 147

Humanities:

Art History 163A, 163B, 163C, 164
Chinese 104, 106, 107, 109, 131, 132
Japanese 101, 102, 103
Religious Studies 172

At least 12 additional units must be selected from the above courses, or from the following: Anthropology 110, 112, 117, 119, 120, 122, 123, 124, 128; Chinese (any upper division course); Economics 115A, 115B, 116, 160A, 160B, 162; Geography 143; History 102G, 102H, 102N; Japanese (any upper division course); Linguistics 100; Political Science 127, 133, 138, 145, 148C; Sociology 118, 141, 170, 183. (Or other appropriate courses, including individual and group study courses (198, 199), as approved by the Committee in charge.)

Total Units for the Major**77-78**

Recommended

Students are strongly urged to take a substantial number of courses in Euro-American civilization as a basis for comparison for a deeper understanding of America's relations with East Asia.

Minor Program Requirements:

Courses taken for the minor are expected to reflect a predominant interest in either China or Japan, but also to provide some exposure to the other of the two countries. All courses counting towards the East Asian Studies major, including individual and group study courses (198, 199), may be used to fulfill the requirements for the minor program, as long as they deal predominantly with China, Japan, or both.

	UNITS
East Asian Studies	22
History 9B and 18 upper division units, of which at least 12 must be in courses focusing on China; OR History 9A and 18 upper division units, of which at least 12 must be in courses focusing on Japan	22

Major Advisers. Consult Program Director.

Courses in East Asian Studies. The following courses count toward the major and are open to students throughout the campus. Refer to departmental listings for course descriptions.

Anthropology

- 148A. Traditional Chinese Society
- 148B. Family, Gender, and Population in Contemporary China
- 149A. Traditional Japanese Society
- 149B. Contemporary Japanese Society

Art History

- 1D. Asian Art
- 163A. Chinese Art
- 163B. Chinese Painting
- 163C. Painting in the People's Republic of China
- 164. The Arts of Japan

Chinese

All courses.

Comparative Literature

- 53A. Literature of China and Japan
- 153. Forms of Asian Literature

Economics

- 171. Economy of East Asia

Geography

- *127. Contemporary East Asia

History

- 9A. History of East Asian Civilization (China)
- 9B. History of East Asian Civilization (Japan)
- 102G. Undergraduate Proseminar: China to 1800
- 102H. Undergraduate Proseminar: China since 1800
- 102N. Undergraduate Proseminar: Japan
- 191A. Classical China
- 191B. High Imperial China
- 191C. Late Imperial China
- 191D. Nineteenth-Century China
- 191E. The Chinese Revolution
- 191F. History of the People's Republic of China, 1949 to the Present
- 194A. Aristocratic and Feudal Japan
- 194B. Early Modern Japan
- 194C. Modern Japan
- 194D. Business and Labor in Modern Japan
- 194E. Education and Technology in Modern Japan

Japanese

All courses.

Linguistics

- *100. Languages of Eastern Asia

Political Science

- 133. The American Role in East Asia
- 138. International Relations: East Asia
- 148A. Government and Politics in East Asia: China
- 148B. Government and Politics in East Asia: Pacific Rim
- 148C. Government and Politics in East Asia: Southeast Asia

Religious Studies

- 70. Introduction to Buddhism
- 75. Chinese Philosophy: An Introduction
- 172. Ch'an (Zen) Buddhism

Sociology

- *147. Sociological Perspectives on East Asia

Courses in East Asian Studies (EAS)

Upper Division Courses

113. Cinema and Society in China (4) III. The Staff Lecture—3 hours; discussion—1 hour. Prerequisite: one course from History 190C, 193, or consent of instructor. Knowledge of Chinese not required. Viewing and analysis of one Chinese film with English subtitles each week, followed by discussion and short essays. Cinematic technique, social values and film topics from 1930s to today. Not open for credit to students who have completed Chinese 113.

192. East Asian Studies Internship (1-12) I, II, III.

The Staff

Internship—3-36 hours; term paper. Prerequisite: upper division standing and consent of instructor. Work experience in the East Asian Studies field, with analytical term paper on a topic approved by the instructor. (P/NP grading only.)

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (Chairperson in charge)

Independent study—1-5 hours. Prerequisite: open only to majors of senior standing who qualify for honors program. Guided research, under the direction of a faculty member, leading to a senior honors thesis on a topic in East Asian Studies culture, society, or language. (P/NP grading only.)

196A-196B. Honors Seminar (4-4) I-II. The Staff Seminar—2 hours; conference—2 hours. Prerequisite: a GPA of 3.5 in the major, senior standing, and consent of instructor. A two-quarter research project culminating in an Honors thesis. A grade of B or higher must be earned to qualify the student for honors distinction at graduation. Deferred grading only, pending completion of sequence.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Ecology (A Graduate Group)

Theodore C. Foin, Ph.D., Chairperson of the Graduate Group Office, 3122 Wickson Hall (916-752-6752)

Faculty. The Group includes faculty from 26 departments in five schools and colleges, and the Bodega Marine Laboratory.

Graduate Study. The Graduate Group in Ecology offers the M.S. and Ph.D. degrees in several areas of specialization within the spectrum of ecology.

The Ecology program is one of the most diverse on the Davis campus. In order to accommodate varied student interests, the Group depends on close consultation between students and faculty for program development. Several curricular plans are now available in specific areas of emphasis. For details, contact the group office.

Preparation. Appropriate preparation is undergraduate work in any of the biological, social or behavioral, and physical sciences, mathematics or engineering. Applicants will normally be expected to have completed two courses each in introductory biology, general chemistry and physics; one course each in calculus, ecology, statistics, and evolution are also required. Applicants in human ecology areas may substitute quantitative social science courses for up to two courses of chemistry or physics. Each of the three broad areas requires certain advanced preparation appropriate to the option. Details may be found in the Group Announcement.

Graduate Advisers. T.C. Foin, W.W. Weathers.

Courses in Ecology (ECL)

Graduate Courses

200A. Principles and Application of Ecological Theory (4) I. Foin

Lecture—3 hours; discussion—1 hour. Prerequisite: first course in ecology; Statistics 102; Mathematics 16A, 16B. Critical evaluation of ecological theory and applications to ecological management. Historical development of ecological theory is emphasized. Critical evaluation of ecological principles pertaining to the structure and dynamic properties of ecological systems, their organization and evolution.

200B. Principles and Application of Ecological Theory (4) II. Foin

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A. Continuation of course 200A. Critical

evaluation of theory and application in the areas of ecological adaptation and system plasticity, spatial and temporal scales, ecological energetics, and system dynamics. Synthesis of ecological theory into testable principles.

201. Ecosystems and Landscape Ecology (4) III. Ustin/Dawson

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A and 200B. Overview of ecosystem and landscape principles (structure, energy, nutrient flow, species diversity, landscape heterogeneity, change and stability), building on ecological principles and theory. Introduction to analysis tools (remote sensing, geographic information systems, modeling) applied to landscape systems.

203. Physiological Ecology of Animals (3) III.

Ellers (Zoology), Cech (Wildlife and Fisheries Biology) Lecture—2 hours; discussion—1 hour. Prerequisite: Zoology 125 or Physiology 110 or the equivalent; elementary calculus. Comparative examination of several animal groups addressing fundamental physiological mechanisms that shape the ecology of the animal group.

204. Population and Community Ecology (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies 100 or Zoology 125, Mathematics 21A-21B, or consent of instructor; Mathematics 22B strongly recommended. Review of major theoretical concepts of population and community ecology, with emphasis on both the rationale of the theory and its correspondence to natural phenomena.

205. Structure of Ecological Communities (4) II. Quinn (Environmental Studies)

Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies 100 or Zoology 125 or Botany 117, Genetics 103 or Botany 100 or Zoology 148, and Mathematics 21A-21B; Ecology 204 and Mathematics 22A-22B strongly recommended. Provides entry-level graduate students and advanced undergraduates an introduction to literature and contemporary research into processes structuring ecological communities. Particular emphasis placed on ecological phenomena with a significant spatial component, e.g., gene flow, colonization, and extinction.

206. Concepts and Methods in Plant Community Ecology (4) I. Rejmanek (Botany), Barbour (Botany), Menke (Agronomy)

Lecture—3 hours; laboratory—4 hours. Prerequisite: introductory courses in statistics and plant ecology; consent of instructor. Principles and techniques of vegetation analysis, including structure, composition, and dynamics. Emphasis given to sampling procedures, association analysis, ordination, processes and mechanisms of succession, and classification. Most techniques are demonstrated or conducted during field trips and laboratories. Offered in alternate years.

207. Plant Population Biology (3) II. Rice (Agronomy), Jain (Agronomy)

Lecture—2 hours; laboratory/discussion—1 hour. Prerequisite: advanced undergraduate ecology course (e.g., Environmental Studies 100, Zoology 125, Botany 117, or Entomology 104) and advanced undergraduate course in genetics and/or evolution (e.g., Genetics 100, 103, or Botany 100). Provides entry-level graduate students and advanced undergraduates with an introduction to both theoretical and empirical research in plant population biology. Emphasis will be placed on linking ecological and genetic approaches to plant population biology. Offered in alternate years. (Same course as Agronomy 207.)

208. Issues in Conservation Biology (4) II. Harrison

Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies 100, Zoology 125, Botany 117, Entomology 106. Graduate-level introduction to current research in conservation biology. Course will emphasize reading and discussing primary literature. Specific topics will reflect the research interests of UCD conservation biology faculty

209. Demography for Biologists (3) II. Carey

Lecture—3 hours. Prerequisite: course 104 or Zoology 125 or the equivalent. Major demographic concepts and techniques including current, abridged and

multiple decrement life tables, analysis of reproduction, stable population theory, stochastic, two-sex and multiregional models and demographic applications such as life history scaling, harvesting theory and curve fitting. Offered in alternate years.

210. Advanced Topics in Human Ecology (4) III.

Orlove (Environmental Studies) Lecture—2 hours; discussion—2 hours. Prerequisite: graduate standing. Course stresses the commonalities that human ecologists have as social scientists who specialize in problems relating human populations and environmental variables. General epistemological issues and theoretical models are reviewed. Similarities and differences of human and biological ecology are examined. Offered in alternate years.

211. Advanced Topics in Cultural Ecology (3) I.

Orlove (Environmental Studies) Lecture—3 hours. Prerequisite: graduate standing. Discussion and evaluation of theories which relate environment, culture and social structure. The works of several major theorists will be examined with regard to analytical models, empirical data, research methodologies, and modes of explanation. Offered in alternate years. (Same course as Anthropology 211.)

212A. Environmental Policy Analysis (4) III.

Sabatier Lecture—3 hours; discussion—1 hour; seminar paper. Prerequisite: course in public policy (e.g. Political Science 107 or 108); course in bureaucratic policy making (e.g., Environmental Studies 166 or Political Science 181); course in intermediate statistics (e.g., Sociology 106 or Agricultural Economics 106). An examination of selected topics in the formulation and implementation of environmental policy, with a principal emphasis on conceptual and methodological issues. Offered in alternate years. (Same course as Environmental Studies 212A.)

212B. Environmental Policy Analysis: Evaluation

(4) I. Schwartz (Environmental Studies) Lecture—1 hour; discussion—1 hour; seminar—2 hours; independent evaluation project. Prerequisite: Economics 100 or the equivalent; Environmental Studies 168A (or the equivalent course in policy analysis or resource economics); intermediate level statistics (e.g., Sociology 106 or Agricultural Economics 106). Examination of recent research and practice in the evaluation of environmentally related policies, programs and plans. Ex-ante and ex-post evaluation will be studied. Offered in alternate years. (Same course as Environmental Studies 212B.)

213. Population, Environment, and Social Structure (4) II. Cramer

Seminar—3 hours; term paper. Prerequisite: at least one course in population or human ecology, or in environment and resources. Relationships among population dynamics, resource scarcity and environmental problems, and social structure; focus on demographic content of global ecological models and simulations, ecological content of modern demographic theories, and debates about scarcity, inequality, and social conflict and change. Offered in alternate years.

214. Use of Temporal/Spatial Landscape Analysis in Conservation (4) II. Schonewald-Cox

Lecture/discussion—3 hours; laboratory—3 hours. Multi-disciplinary analysis of geometric and temporal landscape change applied to conservation. Population and economic change are examined in the context of the spread of urban, rural and transportation systems in fragmentation of habitat. Laboratory applies methodologies to analysis of specific sites. Offered in alternate years.

215. Thermal Ecology and Energetics (3) I.

Weathers Lecture—2 hours; discussion—1 hour. Prerequisite: general chemistry and physics and ecology (e.g., Environmental Studies 100). Review of principles that govern thermal and energy relations of organisms and the application of energy budget analysis to diverse ecological problems. Scaling (allometric analyses) and comparative methods emphasized as techniques for developing empirical ecological theories. Offered in alternate years.

219. Ecosystem Biogeochemistry (4) III. Dahlgren, Bledsoe

Lecture—3 hours; laboratory/discussion—2 hours. Prerequisite: introductory courses in ecology/biology and soils are recommended; undergraduates accepted with consent of instructor. Multi-disciplinary analysis of energy and nutrient transfers within terrestrial ecosystems. Examination of processes and inter- and intra-system interactions between the atmosphere, biosphere, lithosphere, and hydrosphere. Laboratory section uses biogeochemical simulation models to examine case studies. (Same course as Soil Science 219.)

***221. Chemical Aspects of Ecology** (3) I.

Lecture—3 hours. Prerequisite: Chemistry 1A-1B-1C and 8B or 128C (or the equivalent); a course in biological ecology; graduate standing and consent of instructor. A week will be spent on each of nine subjects including chemical ecology of reproduction, nutrition, defense, communication, adaptation, and ecosystem structure and function. Offered in alternate years.

225. Terrestrial Field Ecology (4) III. Karban

Seminar—1 hour; laboratory—12 hours. Prerequisite: introductory ecology and introductory statistics. A field course conducted over spring break and four weekends at Bodega Bay, emphasizing student projects. Ecological hypothesis testing, data gathering, analysis, and written and oral presentation of results will be stressed. (Same course as Entomology 225.)

***230. Analysis of a Selected Ecosystem** (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing. Application of basic ecological principles to the interpretation of biotic and abiotic interrelationships of a particular ecosystem. Recent advances in theory, technique, and basic information are emphasized.

231. Mathematical Methods in Population Biology (3) I. Hastings

Lecture—3 hours. Prerequisite: Mathematics 16C or 21C or the equivalent. Mathematical methods used in population biology. Linear and nonlinear difference equation and differential equation models are studied, using stability analysis and qualitative methods. Partial differential equation models are introduced. Applications to population biology are stressed. (Same course as Population Biology 231.)

232. Theoretical Ecology (3) II. Hastings (Environmental Studies)

Lecture—3 hours. Prerequisite: course 204 or the equivalent, and Mathematics 16C or 21C; or one of courses 100 or 121 or Evolution and Ecology 101, and a strong mathematics background (Mathematics 22A-22B-22C or the equivalent). Examination of major conceptual and methodological issues in theoretical ecology. Model formulation and development will be emphasized. Topics will vary from year to year. May be repeated for credit. Offered in alternate years.

290. Seminar in Ecology (1-3) I, II, III. The Staff (Chairperson in charge)

Seminar—1 to 3 hours. Prerequisite: consent of instructor. Topics in biological, human, physical, and chemical ecology. Students are expected to present an oral seminar on a particular aspect of the general topic under consideration. (S/U grading only.)

291. Biological Conservation (3) II. Schonewald-Cox (Environmental Studies)

Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Examines characteristics of populations that make them vulnerable to extinction and examines various methods that can be used in the restoration process. Although both plants and animals are of interest, emphasis will be on vertebrates. Offered in alternate years.

296. Topics in Ecology (1) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour. Prerequisite: graduate standing in Ecology. (S/U grading only.)

297T. Tutoring in Ecology (1-4) I, II, III. The Staff (Chairperson in charge)

Lecture—1 hour; discussion—1 hour. Prerequisite: graduate standing in ecology; consent of instructor. Teaching ecology including conducting discussion

groups for regular departmental courses under direct guidance of staff. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. (Chairperson in charge)
Prerequisite: graduate standing. (S/U grading only.)

Economics

(College of Letters and Science)

Robert Feenstra, Ph.D., Chairperson of the Department

Department Office, 381 Kerr Hall (916-752-0741)

Faculty

Giacomo Bonanno, Ph.D., Associate Professor
Severin Borenstein, Ph.D., Associate Professor
Colin Cameron, Ph.D., Assistant Professor
Gregory Clark, Ph.D., Associate Professor
Robert C. Feenstra, Ph.D., Professor
L. Jay Helms, Ph.D., Associate Professor
Kevin D. Hoover, D.Phil., Associate Professor
Hiromitsu Kaneda, Ph.D., Professor
Peter H. Lindert, Ph.D., Professor
Louis Makowski, Ph.D., Professor
Klaus Nehring, Ph.D., Assistant Professor
Julie A. Nelson, Ph.D., Assistant Professor
Alan L. Olmstead, Ph.D., Professor
Martine Quinzii, Ph.D., Professor
John E. Roemer, Ph.D., Professor
Kevin D. Salyer, Ph.D., Assistant Professor
Steven M. Sheffrin, Ph.D., Professor
Joaquim Silvestre, Ph.D., Professor
Robert K. Triest, Ph.D., Assistant Professor
Elias H. Tuma, Ph.D., Professor
Gary M. Walton, Ph.D., Professor (*Economics, Management*)
Leon L. Wegge, Ph.D., Professor
Wing T. Woo, Ph.D., Associate Professor

Emeriti Faculty

Andrzej Brzeski, Ph.D., Professor Emeritus
Bruce Glassburner, Ph.D., Professor Emeritus
W. Eric Gustafson, Ph.D., Senior Lecturer Emeritus,
Academic Senate Distinguished Teaching Award
Thomas Mayer, Ph.D., Professor Emeritus
T. Y. Shen, Professor Emeritus

The Major Program

Economics is the study of how individuals, organizations, and societies choose among alternative uses of resources and how these resources are turned into the things people want.

The Program. Economics majors complete an introductory course sequence in economics, in addition to several courses in quantitative methods. Intermediate theory and economic history are taken on the upper division level and then students are free to concentrate the remainder of their units in various areas of interest including more courses in economic theory or history, international economics, labor, industry, alternative economic systems, economic development, public finance, econometrics, or mathematical economics.

Internships and Career Alternatives. Internships for economics majors have been arranged at banks, brokerages, other business enterprises, and governmental units. The internships must complement the student's course work. A degree in economics is excellent preparation for students who want to go on to law school, business school, advanced work in economics, or graduate work in international relations. It is also a good background for careers in management and positions with the government.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	22-26
Economics 1A-1B.....	10
Statistics 13, 32, or 102.....	3-4
Mathematics 16A-16B-16C or 21A-21B-21C.....	9-12
Depth Subject Matter	40
Economics 100, 101.....	10
One course from Economics 110A, 110B, 111A, 111B.....	4
One course sequence from Economics 110A-110B; 111A-111B; 115A-115B; 121A-134; 121A-121B; 125-130; 125-131; 130-131; 136A-136B; 151A-151B; 160A-160B.....	8
Additional economics courses to achieve a minimum of 40 upper division units.....	18
Total Units for the Major	62-66

Recommended

Students considering graduate study in economics or business administration are strongly urged to take Mathematics 21A-21B-21C and 22A.

The Economics Department suggests that Economics 100 and 101 be taken as soon as possible after the introductory courses.

Except under extraordinary circumstances, not more than three economics courses may be taken in any one quarter. In special cases, the department will accept a limited number of related upper division courses from other departments in satisfaction of the economics upper division course requirements. Approval from a departmental adviser is required in all such cases.

Graduation with High or Highest Honors. To be eligible for departmental recommendation for High or Highest Honors in Economics at graduation, a student must take all upper division courses in Economics for a letter grade, earn at least a 3.5 grade-point average in those courses, and complete at least eight units of course work that result in the submission of an Honors project. Consult the College of Letters and Science section of this catalog and contact the Department for more information.

Major Advisers. Contact Department Office.

American History and Institutions. This University requirement can be satisfied by completion of Economics 111A, 111B. (See also under University requirements.)

Graduate Study. Students who meet the admission requirements of Graduate Studies and the Department of Economics may pursue studies leading to the M.A. and Ph.D. degrees. Fields of emphasis for graduate study include: Economic Theory, Monetary Economics, Economic Development, Economic History, International Economics, Labor Economics, Industrial Organization, Economic Systems, Public Finance, Mathematical Economics, and Quantitative Methods (Econometrics).

For information on admission to graduate study, degree requirements, and financial aid, consult the *Graduate Announcement* and contact the chairperson of the departmental graduate committee.

Graduate Advisers. Contact Department Office.

Courses in Economics (ECN)

Lower Division Courses

1A. Principles of Microeconomics (5) I, II, III. The Staff

Lecture—3 hours; discussion—2 hours. Courses 1A and 1B may be taken in either order. Analysis of the allocation of resources and the distribution of income through a price system; competition and monopoly; the role of public policy; comparative economic systems. General Education credit for non-GE course sequence (1A-1B) which will satisfy one GE course: Contemporary Societies.

1B. Principles of Macroeconomics (5) I, II, III. The Staff

Lecture—3 hours; discussion—2 hours. Courses 1A and 1B may be taken in either order. Analysis of the economy as a whole; determinants of the level of income, employment, and prices; money and banking, economic fluctuations, international trade, economic development; the role of public policy. General Education credit for non-GE course sequence (1A-1B) which will satisfy one GE course: Contemporary Societies.

***90X. Lower Division Seminar** (1-2) I. The Staff
Seminar—1-2 hours. Prerequisite: lower division standing and consent of instructor. Examination of a special topic in Economics through shared readings, discussions, and written assignments. May not be repeated for credit. Limited enrollment.

92. Internship and Field Work (1-12) I, II, III. The Staff

Internship—3-36 hours; term paper. Prerequisite: junior or senior standing; availability of internship position or approved field work project; stock-brokerage interns must have completed Management 11A-11B; consent of instructor. Intensive study of practical application of concepts in economics, stressing research methods and empirical analysis. (P/NP grading only.)

98. Group Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

99. Individual Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Intermediate Micro Theory (5) I, II, III. The Staff

Lecture—4 hours; discussion—1 hour. Prerequisite: course 1A, 1B, and Mathematics 16A or Mathematics 21A with a grade of a C- or better in each course. Price and distribution theory under conditions of perfect and imperfect competition. General equilibrium and welfare economics. Not open to students who have received credit for Agricultural Economics 100A or 100B. Only 2 units of credit will be allowed to students who have credit for course 104.

101. Intermediate Macro Theory (5) I, II, III. The Staff

Lecture—4 hours; discussion 1 hour. Prerequisite: courses 1A, 1B and Mathematics 16A or Mathematics 21A with a grade of a C- or better in each course. Theory of income, employment and prices under static and dynamic conditions, and long term growth. Only 2 units of credit will be allowed to students who have credit for course 105.

***103. Economics of Uncertainty and Information** (4) II. Bonnano

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 104, Mathematics 16A and 16B or Mathematics 21A and 21B. Optimal decisions under uncertainty, expected utility theory, economics of insurance, asymmetric information, signalling in the job market, incentives and Principal-Agent theory, optimal search strategies and the reservation price principle.

104. Intermediate Microeconomics (4) I, II, III. The Staff

Lecture—3; discussion—1 hour. Prerequisite: courses 1A, 1B and Mathematics 16A or 21A. Price and distribution theory under conditions of perfect and imperfect competition. Not open to students who have received credit for course 100 or Agricultural Economics 100A or 100B. Intended for non-majors.

105. Intermediate Macroeconomics (4) I, II, III. The Staff

Lecture—3 hours discussion—1 hour. Prerequisite: courses 1A, 1B and Mathematics 16A or 21A. Theory of income, employment and prices, with policy implications. Not open to students who have received credit for course 101. Intended for non-majors.

110A. Economic History (4) II. Clark

Lecture—3 hours; to be arranged—1 hour. Prerequisite:

site: courses 1A-1B or consent of instructor. Survey of economic change in Europe prior to the year 1700; reference to other regions of the Eastern Hemisphere; implications for contemporary economic development.

110B. Economic History (4) III. Clark

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Survey of economic change in Europe from the year 1700 to the present; reference to other regions of the Eastern Hemisphere; implications for contemporary economic development.

111A. Economic History (4) I. Walton

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Survey of economic change in the United States from Colonial times to 1865; reference to other regions in the Western Hemisphere.

111B. Economic History (4) III. Clark

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, or consent of instructor. Survey of economic change in the United States from 1865 to the post World War II era.

115A. Economic Development (4) I, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B. Covers major issues encountered in emerging from international poverty. Issues include problems of growth and structural change, human welfare, population growth and health, labor markets and internal migration. Important issues of policy concerning international trade and industrialization.

115B. Economic Development (4) I, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B. Covers major macroeconomic issues of developing countries. Issues include problems in generating capital, conduct of monetary and fiscal policies, foreign aid and investment. Important issues of policy concerning international borrowing and external debt of developing countries.

116. Comparative Economic Systems (4) II.

Roemer

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 104, Mathematics 16A and 16B, or 21A and 21B. Economic analysis of the relative virtues of capitalism and socialism, including welfare economics. Marxian exploitation theory, the socialist calculation debate (Hayek and Lange), alternative capitalist systems (Japan, Germany, U.S.) and contemporary models of market socialism.

121A. Industrial Organization (4) I. Bonanno

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, 100 or 104, or consent of instructor. An appraisal of the role of competition and monopoly in the American economy; market structure, conduct, and economic performance of a variety of industries.

121B. Industrial Organization (4) III. The Staff

Lecture—3 hours; to be arranged—1 hour. Prerequisite: course 121A. Public policy in a private enterprise economy; antitrust and other policies toward industry; economies of regulated industries.

***123. Ecology and Economics (4) I.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Economies and populations as self-regulating systems; economic regulation of man's interaction with its environment. Topics: population growth and its economic determinants; optimal rates of use of exhaustible and renewable resources; implications of common property in resources; prospects for agricultural growth.

***125. Urban Economics (4) I.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1A, 1B, and 100 or 104. Explores the market forces behind the development of cities, explaining the existence of cities and the spatial distribution of activity within cities. Explores the effects of policies that address problems such as poverty, inadequate housing, congestion, pollution, inferior education, and crime.

130. Public Microeconomics (4) III. Silvestre

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 104, or consent of instructor. Public expenditures; theory and applications. Efficiency and

equity of competitive markets; externalities, public goods, and market failures; positive and normative aspects of public policy for expenditure, including benefit-cost analysis. Topics include consumer protection, pollution, education, poverty and crime.

131. Public Finance (4) I. Helms

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 104. Assessing the economic burden of taxation; equity and efficiency considerations in tax design; structure and economic effects of the U.S. tax system (including personal income tax, corporation income tax, and property tax); tax loopholes; recent developments; tax reform proposals.

134. Financial Economics (4) II. Quinzii; III. Nehring

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A, 1B, and 100 or 104; Mathematics 16A; Statistics 13. General background and rationale of corporation; finance as resource allocation over time; decision making under uncertainty and the role of information; capital market and interest rate structure; financial decisions. Students who have completed Agricultural Economics 171 may not receive credit for this course.

***135. Money, Banks and Financial Institutions (3)**

I, II, III. The Staff

Lecture—3 hours. Prerequisite: courses 1A-1B or consent of instructor. Monetary institutions, the banking system, money creation, the Federal Reserve System, the tools of monetary policy.

136A. Monetary Theory (4) I. Makowski

Lecture—3 hours; discussion—1 hour. Prerequisite: course 101 or 105. Monetary theory; the impact of changes in the quantity of money and of liquid assets on money income.

136B. Monetary Policy (4) II. Salyer

Lecture—3 hours; discussion—1 hour. Prerequisite: course 136A. Analysis of the role of financial intermediaries in the economy and the theory and practice of monetary policy.

140. Econometrics (4) II. The Staff

Lecture—3 hours; laboratory—2 hours. Prerequisite: courses 100 or 104, and 101 or 105; Mathematics 16A-16B or 21A; Statistics 13. Introduction of problems of observation, estimation and hypotheses testing in economics through the study of the theory and application of linear regression models, critical evaluation of selected examples of empirical research and exercises in applied economics.

151A. Economics of the Labor Market (4) I.

Cameron

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 104. Theory of labor supply and demand; determination of wages and employment in the labor market. Economic theories of labor unions. Policy issues: labor force participation by married women; minimum wages and youth unemployment; effect of unions on wages.

151B. Economics of Human Resources (4) II. Nelson

Lecture—3 hours; discussion—1 hour. Prerequisite: course 151A. Human resource analysis; introduction to human capital theory and economics of education; the basic theory of wage differentials, including theories of labor market discrimination; income distribution; poverty. Policy issues; negative income tax; manpower training programs; incomes policy.

160A. International Microeconomics (4) I. Swenson; II. Feenstra

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A, 1B, 100 or 104, or consent of instructor. International trade theory: impact of trade on the domestic and world economies; public policy toward external trade. Students who have completed course 162 may receive only 2 units of credit for course 160A.

160B. International Macroeconomics (4) I. Swenson; III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A, 1B, and 100 or 104, and course 101 or 105, or consent of instructor. Macroeconomic theory of an open economy. Balance of payments adjustment mechanism, international monetary economics issues; international financial institutions and their poli-

cies. Students who have completed course 162 may receive only 2 units of credit for course 160B.

162. International Economic Relations (4) I.

Swenson

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. International trade and monetary relations, trade policy, exchange rate policy, policies toward international capital migration and investment. Emphasis on current policy issues. Course intended especially for non-majors. Students who have completed course 160A or 160B may not receive credit for this course.

***170. Economy of the Middle East (4) III.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A, 1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of the Middle East. Consult department for course scheduling.

***171. Economy of East Asia (4) I.** The Staff (Chairperson in charge)

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of East Asia. Consult department for course scheduling.

***172. Economy of South Asia (4) II.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of South Asia. Consult department for course scheduling.

***173. Economy of South-East Asia (4) III.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of South East Asia. Consult department for course scheduling.

***174. Economy of Europe (4) III.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of Europe. Consult department for course scheduling.

***175. Economy of Sub-Sahara Africa (4) I, II, III.**

The Staff (Chairperson in charge)

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of the Sub-Sahara. Consult department for course scheduling.

***190. Topics in Economics (4) III.** Lindert

Lecture/discussion-seminar—4 hours. Selected topics in economic analysis and public policy. Variable content. May be repeated for credit.

***190X. Upper Division Seminar (1-4) I.** The Staff

Seminar—1-4 hours. Prerequisite: courses 100 or 104; and 101 or 105; and consent of instructor. In-depth examination at an upper division level of a special topic in Economics. Emphasis on focused analytical work. May not be repeated for credit. Limited enrollment.

192W. Internship in the Davis-in-Washington Program (6-8) I, III. The Staff

Internship—18-24 hours. Prerequisite: junior or senior standing in Economics; completion of 84 units of credits with a minimum grade-point average of 3.00; admission to the Davis-in-Washington Program. Internship in Washington, DC with associated research project. Students must arrange for a faculty sponsor before embarking on the internship. Maximum of 3 units will count toward satisfying Economics major requirements. (P/NP grading only.)

194HA-194HB. Special Study for Honors Students (4-4) I-II-III. The Staff (Salyer in charge)

Independent study—3 hours; seminar—1 hour. Prerequisite: major in Economics with senior standing; consent of instructor and completion of 135 units with a minimum grade point average of 3.5 in courses counted toward the major. A program of research culminating in the writing of a senior honors thesis under the direction of a faculty adviser. (Deferred grading only, pending completion of course.)

197T. Tutoring in Economics (1-5) I, II, III. The Staff (Chairperson in charge)

Tutoring—3-15 hours. Prerequisite: consent of instructor and chairperson. Undergraduates assist the instructor by tutoring students in one of the department's regularly scheduled courses. Units may not be counted toward satisfaction of major requirements. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200A. Microeconomic Theory (5) I. Caputo

Lecture—4 hours; discussion—1 hour. Prerequisite: graduate standing. Linear and non-linear optimization theory applied to develop the theory of the profit-maximizing firm and the utility-maximizing consumer. (Same course as Agricultural Economics 200A.)

200B. Microeconomic Theory (5) II. Quinzii

Lecture—4 hours; discussion—1 hour. Prerequisite: course 200A. Characteristics of market equilibrium under perfect competition, simple monopoly and monopsony. Emphasis on general equilibrium and welfare economics; the sources of market success and market failure. (Same course as Agricultural Economics 200B.)

200C. Microeconomic Theory (5) III. Makowski

Lecture—4 hours; discussion—1 hour. Prerequisite: course 200B. Uncertainty and information economics. Individual decision making under uncertainty. Introduction to game theory, with emphasis on applications to markets with firms that are imperfect competitors or consumers that are imperfectly informed. (Same course as Agricultural Economics 200C.)

200D. Macroeconomic Theory (5) II. Hoover

Lecture—4 hours; discussion—1 hour. Prerequisite: course 101, Mathematics 21A, 21B, and 21C. Macrostatic theory of income, employment, and prices.

200E. Macroeconomic Theory (4) III. Salyer

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200B (may be taken concurrently) and 200D. Macrodynamics theory of income, employment, and prices.

201A. History of Economic Thought (4) III. Hoover

Lecture—3 hours; discussion—1 hour. Economic thought from the classical Greece era to modern times. Offered in alternate years.

***201B. History of Economic Thought II** (4) I.

Hoover

Lecture—3 hours; discussion—1 hour. Origins and emergence of modern economic analysis. Offered in alternate years.

***203A. Advanced Economic Theory** (4) I. Silvestre

Lecture—4 hours. Prerequisite: course 200A, 200B. Advanced topics in general equilibrium theory and welfare economics: existence, determinateness and efficiency; intertemporal economies; uncertainty.

***203B. Advanced Economic Theory: Game Theory** (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A, 200B, 200C. Covers the most recent developments in game theory, with the focus changing from year to year. Main topics are: refinements of Nash equilibrium, repeated games, evolution, social situations, bounded rationality, and bargaining theory.

***203C. Topics in Economic Theory** (4) III. Nehring

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A, 200B, 200C. Selected topics in contemporary microeconomic theory. May be repeated for credit with the consent of the Graduate Studies Committee.

204. Microeconomic Analysis (5) I. Hazlett (Agricultural Economics)

Lecture—4 hours; discussion—1 hour. Prerequisite: course 100 (or 100M) or Agricultural Economics 100A-100B; Mathematics 21A, 21B and 21C (or Mathematics 16A, 16B and 16C); open to advanced undergraduates with consent of instructor. Economic

reasoning and social choice: behavior of firms and households, theory of markets, partial and general equilibrium analysis, welfare economics, illustrations and applications. (Same course as Agricultural Economics 204.)

***207. Contemporary Economics Seminar** (1) I, II, III. The Staff

Seminar—1 hour. Prerequisite: graduate standing in Economics. Seminar series on topics of current interest. May be repeated for credit. (S/U grading only.)

***209A. Economics of Distributive Justice** (4) I.

Roemer

Lecture—4 hours. Prerequisite: course 200B. Introduction to social choice theory; envy-free allocations; axiomatic bargaining theory; axiomatic characterizations of resource allocation. Applications to modeling of the distributive theories of political philosophers J. Rawls, R. Dworkin, R. Nozick, and G.A. Cohen.

***209B. Public Ownership Economics** (4) II. Silvestre

Lecture—4 hours. Prerequisite: course 200B. Public ownership from the viewpoint of microeconomics, in particular general equilibrium and welfare economics. Topics include returns to scale and firm ownership, common-pool resources, externalities, and solution concepts for economies with public and private ownership. Offered in alternate years.

***209C. Foundations of Decision Theory** (4) III.

Nehring

Lecture—4 hours. Prerequisite: course 200B. Rigorous exposition of subjective expected utility theory; foundations, normative and empirical challenges. Topics include intertemporal decision; learning, incompleteness and ambiguity; individual and social choice; game theory as interactive decision theory; bounded rationality. Offered in alternate years.

210A. Economic History (4) II. Clark

Lecture/discussion—4 hours. Economic history of the eastern hemisphere in the modern period. Medieval Europe or other regions may be studied, depending on student interest.

210B. Economic History (4) I. Olmstead

Lecture/discussion—4 hours. The United States from Colonial times to the present. Other areas of the western hemisphere may be studied, according to student interest.

***210C. Economic History** (4) III. Lindert

Seminar—4 hours. Prerequisite: a graduate course in economic history. Selected topics and issues, emphasis on current research. (Quarter offered to be flexible.)

214. Development Economics (4) II. Jarvis

Lecture—4 hours. Prerequisite: Agricultural Economics 100A, 100B, course 101; Agricultural Economics/Economics 204 and course 160A-160B recommended. Review of the principal theoretical and empirical issues whose analysis has formed development economics. Analysis of economic development theories and development strategies and their application to specific policy issues in developing country contexts. (Same course as Agricultural Economics 214.)

215A. Agriculture and Economic Development (4) II. Taylor

Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 200A or 204 and 214. Agricultural development theory and application. Analysis of rural-urban linkages and their role in economic development, food price policy, and interactions between economic development and the environment. Analytical focus on household-farm and intersectoral models. (Same course as Agricultural Economics 215A.)

215B. Open Macroeconomics of Development (4) II. Woo

Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 200A or 204, 200D or 205, and 214 or 215A. Models and policy approaches regarding trade, monetary and fiscal issues, capital flows and debt are discussed in the macroeconomic framework of an open developing country. The basic analytical focus is real exchange

rate and its impact on sectoral allocation of resources. (Same course as Agricultural Economics 215B.)

215C. Empirical Approaches to Development Analysis (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 215A, 215B. Extension of development models for policy analysis including Household-Farm models, models of resource allocation under uncertainty. Social Accounting Matrix and Computable General Equilibrium models. Analysis and case studies of methods of project evaluation with and without income-distribution weights. (Same course as Agricultural Economics 215C.)

221A. Industrial Organization (4) I. Bonanno

Lecture—3 hours; to be arranged—1 hour. Analysis of market structure, business behavior, and economic performance under conditions of limited governmental interference.

221B. Industrial Organization (4) III. The Staff

Lecture—2 hours; seminar—2 hours. Social standards and public policies toward the business sector of the economy.

***221C. Topics in Industrial Organization** (4) III. The Staff

Lecture—3 hours; seminar—1 hour. Prerequisite: course 221A. Advanced topics in industrial organization and in applied microeconomics. Emphasis on current research. Contents may vary from year to year.

***225. Urban Economics** (4) III. The Staff

Lecture—2 hours; discussion—2 hours. Prerequisite: course 200A or 204. Explains development of cities and land-use patterns within cities. Explores efficiency and equity effects of local spending and taxes. Analysis of urban problems such as transportation (congestion, pollution, mass transit), crime, and inadequate housing.

230A. Public Economics (4) I. Helms

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A or 204. Measures of deadweight loss and consumer surplus; optimal commodity and income taxation; tax incidence; policy issues in personal taxation, corporate taxation, and social insurance; evaluation of effective tax rates.

230B. Public Economics (4) II. Triest

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A or 204. Effects of tax policies on economic behavior; production, consumption, savings, investment, and labor supply. Distribution and equity: social welfare evaluation and the measurement of inequity.

230C. Public Economics (4) III. Nelson

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A or 204. Advanced topics in economics of the public sector, with emphasis on current research. Content may vary from year to year.

235A. Alternative Approaches to Monetary Analysis (4) II. Sheffrin

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200D (may be taken concurrently). Focuses on relation between changes in money supply and changes in nominal GNP. Also discusses the effect of changes in money supply on interest rates.

235B. Monetary Theory (4) III. Salyer

Lecture—3 hours; discussion—1 hour. Prerequisite: course 235A. Emphasizes problem of finding an appropriate place for money in microeconomic/general equilibrium models. Consideration given to meaning of money, its relation to inflation and the real economy and to its role in models of finance.

***235C. Monetary Policy** (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Organization of the Federal Reserve Bank, the definition of money, goals and tools of monetary policy, alternative targets for monetary policy, impact of monetary policy, the problem of lags, alternative policies.

240A. Econometric Methods (4) II. Green

Lecture—4 hours. Prerequisite: Statistics 133 and a course in linear algebra or the equivalent. Least squares, instrumental variables, and maximum likelihood estimation and inference for single equation linear regression model; linear restrictions; het-

eroskedasticity; autocorrelation; lagged dependent variables. (Same course as Agricultural Economics 240A.)

240B. Econometric Methods (4) III. Havenner (Agricultural Economics)

Lecture—4 hours. Prerequisite: course 240A. Topics include analysis of variance, pooled time-series, cross-section estimation, seemingly unrelated regression, classical hypothesis tests, and identification and estimation of simultaneous equation models. (Same course as Agricultural Economics 240B.)

240C. Econometric Theory (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 240B. Finite sampling theory; nonlinear and dynamic econometric models; asymptotic distribution theory. (Same course as Agricultural Economics 240C.)

240D. Topics in Econometrics (4) I. Cameron

Lecture—3 hours; discussion—1 hour. Prerequisite: course 240B. Advanced topics in nonlinear econometric modelling. Contents may vary from year to year. (Same course as Agricultural Economics 240D.)

***250A. Labor Economics (4) II.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 150A-150B or the equivalent. Philosophy, theory and history of American and foreign labor movements; union structure, organization and collective bargaining under changing labor market conditions; current labor market issues.

***250B. Labor Economics (4) III.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 151A or consent of instructor; course 204 or 200A recommended. Microeconomic theory of labor supply and labor demand, estimation of labor supply and demand functions; human capital theory; labor market analysis.

256. Applied Econometrics (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: master students in agricultural economics or economics, or consent of instructor. Application of statistical tools to economic and business analysis. Emphasis on regression analysis, problems of specification, and model development. (Same course as Agricultural Economics 256.)

260A. International Economics (4) I. Feenstra

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A or 204. Theory of trade determinants; gains from trade; tariffs and effective protection; economic unions.

260B. International Economics (4) II. Woo

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 200D and 200E. Balance of payments adjustment mechanisms; foreign exchange markets' theories of balance of payments policy and international monetary mechanisms.

260C. International Economics (4) III. Swenson

Seminar—4 hours. Prerequisite: course 260A and 260B. Survey of current literature in international trade theory.

***280. Orientation to Economic Research (2) I.** The Staff

Discussion—2 hours. Course tries to bridge the gap between students' classwork and their subsequent research. It deals with topics such as the origination of a research project, some mechanics of empirical research and hints on the submission of research papers. (S/U grading only.)

***290. Topics in Economics (4) I, II, III.** The Staff

Seminar—4 hours. Prerequisite: consent of instructor. Selected topics in economic analysis and public policy, focusing on current research. May be repeated for credit.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Discussion—1-5 hours. Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor and graduate standing. (S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff

(S/U grading only.)

Professional Course

397. Teaching of Economics (2) I. Walton

Lecture/discussion—2 hours. Prerequisite: graduate standing in economics. Teaching of economics: methods of instruction, organization of courses, examination and evaluation procedures. (S/U grading only.)

Economy, Justice, and Society

John E. Roemer, Ph.D., Program Director and Professor of Economics

Program Office, 370 Kerr Hall (916-752-0743)

Committee in Charge

Fred Block, Ph.D. (*Sociology*)

David Copp, Ph.D. (*Philosophy*)

Robert Jackman, Ph.D. (*Political Science*)

Klaus Nehring, Ph.D. (*Economics*)

John Roemer, Ph.D. (*Economics*)

Joaquim Silvestre, Ph.D. (*Economics*)

Richard Sinopoli, Ph.D. (*Political Science*)

Graduate Study. The Program on Economy, Justice, and Society offers a designated emphasis in Economy, Justice, and Society. This new emphasis is open to students pursuing a doctoral degree in philosophy, political science, or economics. The designated emphasis will provide interdisciplinary training in related aspects of economic theory, political theory, and political philosophy. Students will take one or two core courses offered by the program, a designated field in their home department, a choice of three designated courses in the other two departments, and will attend an advanced workshop/seminar run by the program. For students choosing the emphasis, these requirements will be in lieu of some requirements for the Ph.D. in the participating departments. Upon graduation, students will receive a Ph.D. in their major with a designated emphasis in Economy, Justice, and Society.

Graduate Adviser. Consult program office or a program graduate adviser in one of the three departments listed above.

Courses in Economy, Justice, and Society (EJS)

Upper Division Course

100. Microeconomic Theory (4) III. Nehring

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A; or graduate standing. Basic concepts, modes of reasoning and fundamental results in modern microeconomics. Emphasis on, first, Utility Theory; second, the logic of the equilibrium methods; third, welfare economics and public policy.

Graduate Courses

***207A. Interdisciplinary Social Analysis (3) II.** The Staff (Director in charge)

Lecture—2 hours; term paper. Prerequisite: graduate standing in economics, philosophy, or political science; course 100, Philosophy 117, or the equivalents. Analysis of practical and theoretical social problems with tools of economic theory, philosophy, and political theory, e.g., the welfare state, risk and public policy, equality of opportunity, individual rationality and cooperation. Offered in alternate years. (Deferred grading only, pending completion of sequence.)

207B. Interdisciplinary Social Analysis (3) II. The Staff (Director in charge)

Lecture—2 hours; term paper. Prerequisite: course 207A. Continuation of course 207A. Offered in alternate years. (Deferred grading only, pending completion of sequence.)

***209A. Economics Models of Distributive Justice (4) I.** Roemer

Lecture—4 hours. Prerequisite: course 100 or the equivalent, and graduate standing. Introduction to social choice theory; envy-free allocations; axiomatic bargaining theory; axiomatic characterizations of resource allocation. Applications to modeling of the distributive theories of political philosophers. Offered in alternate years.

***209B. Economic Models of Public Ownership (4) II.** Silvestre

Lecture—4 hours. Prerequisite: course 100 or the equivalent and graduate standing. Public ownership from the viewpoint of microeconomics, in particular, general equilibrium and welfare economics. Topics include returns to scale and firm ownership, common-pool resources, externalities, and solution concepts for economies with public and private ownership. Offered in alternate years.

***209C. Foundations of Decision Theory (4) III.** Nehring

Lecture—4 hours. Prerequisite: course 100 or the equivalent and graduate standing. Rigorous exposition of subjective expected utility theory; foundations, normative and empirical challenges. Topics include intertemporal decision; learning; incompleteness and ambiguity; individual and social choice; game theory as interactive decision theory; bounded rationality. Offered in alternate years.

Education

(Intercollege Division)

Jon Wagner, Ph.D., Director of the Division (2075 Academic Surge)

Jonathan H. Sandoval, Ph.D., Associate Director of the Division

Barbara J. Merino, Ph.D., Director of Teacher Education

Barbara G. Goldman, Ph.D., Associate Director of Teacher Education

Sandra M. Murphy, Ph.D., Director of the CRESS Center

Division Office, 2074 Academic Surge (916-752-8258; FAX: 916-752-5411)

Student Services, 2078 Academic Surge (916-752-0757)

CRESS Center Office, 2060 Academic Surge (916-752-0281; FAX: 916-752-6135)

Faculty

Donald G. Arnstine, Ph.D., Professor
Concha Delgado-Gaitan, Ph.D., Associate Professor

Sharon S. Dugdale, Ph.D., Professor

Richard A. Figueroa, Ph.D., Professor

Michele L. Foster, Ph.D., Associate Professor (*Education, African American and African Studies*)

Patricia M. Gandara, Ph.D., Assistant Professor

Barbara G. Goldman, Ph.D., Lecturer in and Supervisor of Teacher Education (*Education, Applied Behavioral Sciences*)

Pauline V. Holmes, M.A., Supervisor of Teacher Education

Anna T. Kato, Ed.D., Supervisor of Teacher Education

Barbara J. Merino, Ph.D., Professor

Sandra M. Murphy, Ph.D., Associate Professor

Keith H. Osajima, Ph.D., Assistant Professor (*Education, Asian American Studies*)

Jonathan H. Sandoval, Ph.D., Professor

Robert M. Van Dyne, Ed.D., Supervisor of Teacher Education

Jon Wagner, Ph.D., Professor

David R. Wampler, Ph.D., Lecturer in and Supervisor of Teacher Education

Karen A. Watson-Gegeo, Ph.D., Professor

Emeriti Faculty

Hugh C. Black, Ph.D., Professor Emeritus

G. Phillip Cartwright, Ph.D., Professor Emeritus
Douglas L. Minnis, Ed.D., Lecturer Emeritus
Julius M. Sassenrath, Ph.D., Professor Emeritus
Carlton J. Spring, Jr., Ph.D., Professor Emeritus
George D. Yonge, Ph.D., Professor Emeritus

Cooperative Research and Extension Services for Schools (CRESS) Staff

Sandra Murphy, Ph.D., Director, CRESS Center
Nancy Aaberg, M.A., Director, Northern California Mathematics Project
Pam Castori, M.A., Director, Sacramento Area Science Project
Jacqueline Cheong, Ph.D., Director, Assessment, Research and Development Project
Kathy Dixon, Ph.D., Publications Editor
Beth Hart, M.A., Education Extension Specialist for Healthy Start
Barbara Hoffman, M.A., Co-Director, Sierra North Arts Project
Pauline Holmes, M.A., Associate Director for Inservice Programs, Area 3 Writing Project
Judith Kysh, M.A., Education Extension Specialist for Mathematics; Co-Director, College Preparatory Mathematics
Rachel Lodge, M.A., Director, Healthy Start Field Office
Robin Marion, B.S., Education Extension Specialist for Science
Jayne Marlink, M.A., Director, Area 3 Writing Project
Kathy Medina, M.A., Director, Area 3 History and Cultures Project
Deborah Pittman, D.M.A., A.B.D., Co-Director, Sierra North Arts Project
Wendell Potter, Ph.D., Director, Instructional Technology for LEP Students
Keith Prior, B.S., Coordinator, Instructional Technology for LEP Students
Tom Sallee, Ph.D., Co-Director, College Preparatory Mathematics Project

Program of Study

The Division of Education does not offer an undergraduate major program. However, it does offer a minor.

Minor Program Requirements:

Educational theory is considered to be the foundation or basic area for undergraduates to elect as a minor if they wish to (1) major in an allied program, (2) obtain a master's degree in education or allied field, (3) obtain a Ph.D. degree in education, (4) enter a profession that focuses on work with people, (5) seek employment in governmental or industrial training programs, or (6) obtain a better understanding of the issues and concerns of public and private education.

UNITS

Education (minimum units) **20-23**
Education 110 or 111 4
One course from Education 120 or 123 4
Depth courses 12-15
At least 12-15 units from Education not used above: 100, 110, 111, 115, 120, 123, 130, 145, 151, 152, 153, or 163 chosen in consultation with an Education adviser.

Minor Advisers. All faculty members who teach undergraduate courses.

Teacher Education

For a statement of complete requirements and appointments with credential advisers, contact the divisional Student Services Office, 2078 Academic Surge. Interested students are urged to do this as early as possible in their academic career.

Applicants to the elementary or secondary credential programs should contact the Student Services Office for forms and procedural information early in the **fall quarter** of their senior year.

Teacher Education Faculty Advisers—Elementary. D.R. Wampler.

Bilingual Emphasis. B.J. Merino.

Teacher Education Faculty Advisers—Secondary. P. Holmes, R. Van Dyne.

Graduate Adviser. B. Merino, B. Goldman (Credential Program).

Graduate Study. The Division offers programs of study and research leading to the M.A. and Ph.D. degree in Education. The Ph.D. is offered by the Education Graduate Group. Detailed information regarding graduate study may be obtained by writing the Graduate Adviser, Division of Education, 2078 Academic Surge.

Graduate Adviser. G.D. Yonge J. Sandoval (M.A. and Ph.D. degree).

Joint UCD/CSU Fresno Doctoral Program (Ed.D.)

Rosemary Papalewis, Ph.D. (CSU Fresno) and Douglas Minnis, Ed.D. (UC Davis), Program Administrators. UC Davis office, 252 Mrak Hall (916-752-1473; FAX, 916-752-6222).

The joint (UCD/CSU Fresno) doctoral program leads to the Doctorate in Education (Ed.D.) in Educational Leadership. Contact Professor Rosemary Papalewis at CSU Fresno for information and application materials (209-228-2050; FAX: 209-228-2055).

Courses in Education (EDU)

Lower Division Course

98. Directed Group Study (1-5) I, II, III. The Staff (Director in charge)

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

100. Introduction to Schools (4) I, II, III. Wampler Lecture—3 hours; field work—3 hours. Prerequisite: upper division standing. Study of occupational concerns of teachers; skills for observing classroom activities; school organization and finance; school reform movement; observing, aiding, and tutoring in schools.

110. Educational Psychology: General (4) I, II, III. The Staff (Director in charge)

Lecture/discussion—4 hours. Prerequisite: Psychology 1; upper division standing. Learning processes, cognitive development, individual differences, testing and evaluation. General Education credit: Contemporary Societies.

***111. Introduction to Psychopedagogics** (4) I, II, III. Yonge

Lecture/discussion—4 hours. Prerequisite: Psychology 1 and upper division standing. Introduction to the human science of pedagogics (education) with special emphasis on the psychopedagogic perspective. Such topics as the pedagogic situation, learning and becoming, teaching and the lesson structure, and the methods of pedagogics will be considered.

***114. Quantitative Methods in Educational Research** (4) I. Yonge

Lecture/discussion—4 hours. Prerequisite: two years of high school algebra. Problems and methods in data analysis. Design of research projects. Some consideration of procedures suited to digital computers.

115. Educating Children with Disabilities (2) II, III. Figueroa, Spring

Lecture—2 hours. Prerequisite: upper division standing. Educational issues and processes involved in teaching children with disabilities. The course will focus on the structure of special education, with an emphasis on meeting the educational needs of children who are mainstreamed in regular classes.

***117. Psychology of Reading** (4) I. The Staff (Director in charge)

Lecture/discussion—4 hours. Prerequisite: Psychology 1 and upper division standing. Theory and research on psycholinguistic processes involved in learning to read. Topics include reading readiness, word recognition and spelling, knowledge of the orthographic system, phonological awareness, interactive processes, influence of dialect, difficulties of poorer readers.

120. Philosophical and Social Foundations of Education (4) III. Wagner, Arnstine, Foster

Lecture—2 hours; discussion—2 hours. Prerequisite:

upper division standing. Philosophical, historical, and sociological study of education and the school in our society. General Education credit: Civilization and Culture.

***122. Civil Rights of Teachers and Students** (4) I, III. The Staff (Director in charge)

Discussion—4 hours. Prerequisite: upper division standing. Rights of teachers and students under the U.S. and California Constitutions and under Federal and State laws. Emphasis on the rights of speech, press and assembly, religious autonomy, due process, equal protection and privacy. General Education credit: Contemporary Societies.

***123. John Dewey and the Foundations of Education** (4) I. Arnstine

Lecture/discussion—4 hours. Prerequisite: upper division standing. The philosophical and social foundations of education as interpreted by Dewey. While focusing on his critique of American education and his systematic proposals for reform, attention will also be given to criticisms of Dewey.

***130. Issues in Higher Education** (4) III. Arnstine
Discussion—3 hours; field work—3 hours. Prerequisite: upper division standing or consent of instructor. Analysis of current issues in higher education and of some practical implications of varying philosophical approaches to the role of the university.

***132. Church, State and School** (4) III. The Staff (Director in charge)

Discussion—4 hours. Prerequisite: upper division standing; course 122 or the equivalent. Analysis of the decisions of the United States Supreme Court applying the free exercise and establishment clauses of the first amendment to the relationship between church, state, and schools. General Education credit: Contemporary Societies.

***145. Aesthetics in Education** (4) II. Arnstine
Lecture/discussion—4 hours. Prerequisite: upper division standing. Considers the role of the arts in education. Examines various conceptions of the nature of art and aesthetic experience, and relates this to instructional procedures.

151. Language Development in the Chicano Child (3) I. Merino

Lecture—3 hours. Prerequisite: some knowledge of Spanish and linguistics recommended. Bilingualism, first and second language acquisition, bilingual education, language assessment, Chicano Spanish, and the role of dialect varieties in the classroom.

152. Communication Skills for Bilingual Teachers (3) III. The Staff (Merino in charge)

Lecture—2 hours; field work—3 hours. Prerequisite: course 151; Spanish 2, 8A-8B. The development of communication skills of prospective educators with an emphasis on the study and use of standard Spanish and Southwest Spanish dialects in teaching science, mathematics, social science, music, art, and language arts to bilingual elementary school pupils.

153. Cultural Diversity and Education (2) III.

Merino and staff
Lecture/discussion—2 hours. Prerequisite: upper division standing. Analysis of research on learning styles among culturally-diverse students with review and evaluation of responsive curricula and classroom teaching techniques. The ethnographic interview as a research tool.

160A. Introduction to Peer Counseling (2) I, II. Rodolfo

Lecture/discussion—2 hours. Prerequisite: upper division standing and consent of instructor. Introduction to peer counseling techniques and development of peer counseling skills. (P/NP grading only.)

160B. Issues in Peer Counseling (2) I, II, III. Rodolfo

Lecture/discussion—2 hours. Prerequisite: upper division standing and consent of instructor; course 160A recommended. In-depth review and development of skills for specific counseling topics. May be repeated once for credit when topic differs. (P/NP grading only.)

***163. Guidance and Counseling** (4) III. Figueroa, Sandoval, and staff
Lecture—4 hours. Prerequisite: course 110 (may be taken concurrently). Nature and scope of pupil per-

sonnel services; basic tools and techniques of guidance; theory and practice of counseling psychology, with emphasis on educational and vocational adjustment.

180. Computers in Education (3) I, II, III. Dugdale
Lecture—1 hour; seminar—1 hour; laboratory—3 hours. Prerequisite: upper division standing. Applications of computers in education as instructional, intellectual, and communication tools.

192. Internship (1-5) I, II, III. The Staff (Director in charge)
Discussion—1 hour; field work—2 to 15 hours; term paper. Prerequisite: upper division standing; consent of instructor. Internship in schools under supervision of a faculty member. May be repeated once for credit. (P/NP grading only.)

197T. Tutoring in Education (1-2) I, II, III. The Staff (Director in charge)
Tutoring—1-2 hours. Prerequisite: upper division standing and consent of instructor. Leading of small voluntary discussion groups affiliated with the Division's upper division courses under the supervision of, and at the option of, the course instructor, who will submit a written evaluation of the student's work. May be repeated once for credit for a total of 4 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Director in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Director in charge)
Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

Graduate Courses

200. Educational Research (4) III. Spring, Gandara
Lecture—2 hours; discussion—2 hours. Prerequisite: introductory statistics and graduate standing in education or consent of instructor. Defining educational research questions, reviewing relevant literature, developing research designs, developing research instruments, selecting appropriate data analysis procedures, and writing research projects. A case problem will provide practice in designing and reporting research.

201A. Ethnographic Research in Schools I: Current Theory and Practice (4) I. Delgado-Gaitan, Watson-Gegeo
Lecture—4 hours. Prerequisite: graduate standing. Review of current literature from anthropology and society related to schools, with emphasis on the organizational structure of institutions, and the analysis of face-to-face interaction. Will explore the relationship between field-based research and theory development on the acquisition of knowledge in specific social and cultural contexts.

201B. Ethnographic Research in Schools II: Field-Based Research Projects (4) II. Watson-Gegeo
Discussion—4 hours. Prerequisite: graduate standing and course 201A. Student research projects in specific schools with cooperative critical analysis of the design, data collection, and inferencing by researchers. Students will continue to meet with instructor as a group throughout the quarter to discuss specific projects.

202. Philosophy of Education: Models and Methods (4) III. Arnstine
Seminar—4 hours. Prerequisite: graduate standing and consent of instructor. Examples of some major philosophical points of view about educational aims, illustrations of several types of philosophical discourse and argumentation, and an opportunity for students to locate and critique some contemporary studies in philosophy of education. Offered in alternate years.

203. Qualitative Research in Education (4) III. The Staff
Seminar—2 hours; lecture—2 hours. Prerequisite: graduate standing or consent of instructor. Examines the design and conduct of educational research using non-numerical data (e.g., text, discourse, imagery and artifacts). Focuses on issues (e.g., validity, reliability, generalizability, ethics) and reporting genres

(e.g., narrative accounts, case studies, and arguments).

204. School Change and Educational Reform (4) II. Wagner
Lecture/discussion—2 hours; seminar—2 hours. Prerequisite: graduate standing in Education with course 120 or the equivalent, or consent of instructor. Analysis of models, processes, and case studies of school change and educational reform with respect to variable characteristics of schools and schooling, planned and unplanned change, the moral evaluation of school change, and the role of educational research.

205. The Concept of Mind in Teaching (4) III. Arnstine
Seminar—4 hours. Philosophical analysis of the problems of educational practice which are created, aggravated, and sometimes solved by varying conceptualizations of mind and thinking. Offered in alternate years.

207. Concepts of the Curriculum (4) I. Arnstine, Lecture—2 hours; discussion—2 hours. Prerequisite: graduate standing or consent of instructor. Development of the skills of philosophical analysis and argument for the establishment of a point of view, in the consideration of curriculum theory and practice. Classical and contemporary approaches to subject matter and activity emphases, hidden curriculum, and moral education.

***209. Pedagogics (4)** III. Yonge
Seminar—4 hours. Critical analysis of the literature available in English dealing with theoretical and practical issues in education in terms of Pedagogics (i.e., an existential phenomenological approach to the systematic study of education).

210. The Psychology of School Learning (4) I. Sandoval
Lecture/discussion—4 hours. Study of human learning theory and research related to learning in school. Classical approaches of scholars such as Ausubel, Brunner, Gagne, Piaget, Vygotsky, Skinner. Review of contemporary issues of constructivism, metacognition, problem solving, learning strategies, science and mathematics learning.

211. Psychopedagogics (4) II. Yonge
Seminar—4 hours. Prerequisite: graduate standing or consent of instructor. Phenomenological approach to the psychological aspects of the educational situation (psychopedagogics). A critical consideration of how psychopedagogics contributes to the theory and practice of education.

***213. Individual Assessment (4)** III. Sandoval
Lecture—4 hours. Prerequisite: courses 114 and 219, admission to school psychology credential program. Theories of intellectual functioning and the measurement of cognitive abilities in school-aged children. Supervised practice in administration and scoring of contemporary tests for children including the WISC-R, the WAIS-R, the Stanford Binet, the McCarthy Scales of Children's Ability.

***214. Assessment of Children's Personality (4)** III. Sandoval
Lecture—3 hours; field work—3 hours (minimum). Prerequisite: admission to school psychology credential program; courses 213 and 218; and familiarity with basic personality theory and theories of motivation. Study of the projective hypothesis; concepts of personality and its measurement; legal and ethical issues in personality assessment; interviewing techniques in assessment of social and affective functioning; specific measures in personality assessment; reporting on personality assessments; school interventions. Offered in alternate years.

215. Motivation and Behavior Modification (4) II. Spring
Seminar—4 hours. Prerequisite: graduate standing or consent of instructor. Factors related to influencing behavior in educational settings, including analyses of intrinsic and extrinsic motivation, psychological reactance, locus of control, achievement attribution, and behavior modification.

218. Testing Minority Children (4) I. Figueroa
Lecture—3 hours; field work—3 hours. Prerequisite: admission to school psychology program or to M.A. bilingual education program or consent of instructor. Emphasizing tests and techniques that are appropriate for use with Hispanic students. The use of multicultural pluralistic assessment. Review studies and guidelines on use of tests with minority children. Offered in alternate years.

219. Educational Testing and Evaluation (3) I. Gandara
Seminar—3 hours. Prerequisite: courses 114 and 200 or consent of instructor. Study of test theory as it applies to research and evaluation in education, with an emphasis on general ability and reading tests. Offered in alternate years.

231. Culture and Learning (4) II. Delgado-Gaitan
Seminar—4 hours. Prerequisite: graduate standing in Education with course 120 or the equivalent, or consent of instructor. Analysis of major theories of relationships between learning and the sociocultural context in which learning takes place, issues related to the academic achievement of different language groups, and implications for research and pedagogical reform.

232. Families and Communities as Educational Contexts (4) I. Delgado-Gaitan
Seminar—4 hours. Prerequisite: graduate standing in Education or consent of instructor. Families and cultural communities are important social contexts of education for children. An interdisciplinary perspective is presented in an attempt to understand how learning in these social contexts influences the schooling of children.

233. Anthropology of Education (4) I. Foster
Seminar—3 hours; term paper. Prerequisite: one of the following courses: Anthropology 117, 127, 129, or 222, or Education 231, 201A, or 201B, or consent of instructor. Uses concepts of anthropology to examine education in such settings as family, community, and formal institutions of schooling. Course goal is to raise questions about educational issues often taken for granted and provide a perspective from which problems may be analyzed. Offered in alternate years. (P/NP grading only.)

235. Critical Pedagogy (4) III. Delgado-Gaitan
Seminar—4 hours. Prerequisite: Critical Theory 200A and graduate standing. A sociocultural critique, from an interdisciplinary perspective, of educational reform and change. The critique will include an analysis of the influence of text content on the perpetuation of social power differences.

237. Education and Social Policy (4) III. Gandara
Seminar—4 hours. Prerequisite: graduate standing in Education or consent of instructor. Focuses on understanding the social and political context of education in the U.S. and California and how education policy is formed in the broader public policy arena. Develops skills in educational policy analysis. Offered in alternate years.

239. Discourse Analysis in Educational Settings (4) II. Watson-Gegeo
Seminar—3 hours; term paper. Prerequisite: graduate standing and at least one previous course in linguistics or sociolinguistics, or consent of instructor. Examines form and type in discourse (e.g., narration, conversation, routines), approaches to discourse analysis, and research on classroom discourse (lessons, teaching/learning interactional sequences). Final term paper is an analysis of discourse data tape-recorded by student in a field setting.

***241. Research on Reading and Spelling Acquisition (4)** III. Murphy, Spring
Seminar—4 hours. Prerequisite: graduate standing in Education or consent of instructor. Analysis and critique of research on psychological processes in learning to read and spell. Topics include writing systems, theories of processes and acquisition, emergent reading, readiness, decoding, word reading, oral text reading, spelling stages, instructional methods, disability, dialect. Offered in alternate years.

242. Research on Text Comprehension (4) I.

Spring
Seminar—4 hours. Prerequisite: graduate standing in Education or consent of instructor. Analysis and evaluation of research related to the comprehension of written and oral text, with an emphasis on the teaching and learning of comprehension processes in school settings. The course will focus on current issues and on research methodology. Offered in alternate years.

***243. Research on the Teaching and Learning of Writing (4) III.** Murphy

Seminar—4 hours. Prerequisite: graduate standing in Education or consent of instructor. Study of issues in research on composition; history of composition studies; data analysis techniques; product and process approaches; cognitive and social perspectives. Offered in alternate years.

251. Research in Bilingual and Second Language Education (3) III. Merino

Seminar—3 hours. Prerequisite: course 151; knowledge of a foreign language. Discussion and analysis of recent research in bilingual and second language education. Topics include: language acquisition in second language learners and bilinguals, second language teaching methods, language-use models in bilingual education, interaction analysis in bilingual/cross-cultural classrooms, use of the vernacular in classrooms. Offered in alternate years.

***252. Multicultural Teaching and Curriculum (3) III.** Merino

Seminar—2 hours; field work—3 hours. Prerequisite: graduate standing or consent of instructor. Cross-cultural research on socialization, motivation, language acquisition and cognition and its application to effective classroom strategies and curriculum development for minority students. Students will develop and implement multicultural curriculum as well as use ethnographic research techniques in an educational setting. Offered in alternate years.

253. Language and Literacy in Linguistic Minorities (3) II. Merino, Watson-Gegeo

Seminar—2 hours; fieldwork—3 hours. Prerequisite: familiarity with another language and culture; graduate standing. Analysis and application of research on oral language development and literacy in language minority students, through the development, implementation, and evaluation of research-based language arts curriculum.

255. Curriculum Development and Evaluation in Mathematics (4) I. Dugdale

Seminar—4 hours. Prerequisite: graduate standing in Education with upper division coursework in mathematics or consent of instructor. Analysis of curricular issues and goals in mathematics education, including long-term trends, current status and influences, proposed changes, and evaluation issues. Selected curriculum projects will be examined.

***256A. Research in Mathematics Education (4) II.** Dugdale

Seminar—4 hours. Prerequisite: graduate standing in education with upper division coursework in mathematics, or consent of instructor. Examination of research process in mathematics education; review of critical productive problems identified by researchers; evolution of trends, issues, theories and hypotheses in various areas of mathematics education research. Course emphasizes research foundations. Offered in alternate years.

256B. Research in Mathematics Education (4) II. Dugdale

Seminar—4 hours. Prerequisite: graduate standing in education with upper division coursework in mathematics, or consent of instructor. Current research issues and activities in mathematics education: status, trends, theories and hypotheses. Formulation of research questions and design of studies. Projection of future directions for research. Offered in alternate years.

257. Computer Technology in Mathematics Education (4) III. Dugdale

Seminar—4 hours. Prerequisite: graduate standing in Education with mathematics coursework; or consent of instructor. The roles of calculators, computers, and

graphing calculators in mathematics education will be addressed, with emphasis on the impact of these technologies on curriculum reform. Selected efforts to integrate technology into mathematics instruction will be examined. Offered in alternate years.

***271. Recent Developments in Social Studies Education (3) III.** Lowry

Lecture—2 hours; field work—2 hours. Prerequisite: consent of instructor. Analysis of the rationales, goals, objectives, and assumptions about learning and teaching strategies, and evaluation techniques in selected social studies curriculum projects.

***275. Effective Teaching (4) I.** Minnis

Seminar—4 hours. Review of research on the relationship of effective teacher behavior and student learning. Use of research on teacher effectiveness to develop teaching strategies. Ways to decide on the most appropriate instructional strategies in specific teaching situations.

290C. Research Conference in Education (1) I, II, III. The Staff (Director in charge)

Discussion—1 hour. Prerequisite: graduate standing. Presentations and critical discussions of research in education by graduate students with their major professor. May be repeated twice for credit. (S/U grading only.)

291. Proseminar in Education (3) I, II. Sandoval

Seminar—3 hours. Prerequisite: admission to the Ph.D. graduate program in education. Seminar for first-year education doctoral students. The study of multi-disciplinary research approaches to educational issues. Reports and discussion of recent advances in education. Speakers from the graduate group faculty in education. May be taken twice for credit.

293. Topical Seminar in School Psychology (3) I, III. Sandoval

Seminar—3 hours. Prerequisite: graduate standing in education and consent of instructor. Critical study of selected issues in education and school psychology related to the learning and mental health of children and adolescents in schools. May be repeated once for credit.

298. Group Study (1-5) I, II, III. The Staff (Director in charge)

(S/U grading only.)

299. Individual Study (1-6) I, II, III. The Staff (Director in charge)

Independent study—3-18 hours. Individual study under the direction of a faculty member. (S/U grading only.)

299D. Research (1-6) I, II, III. The Staff (Director in charge)

Independent study—3-18 hours. Research for individual graduate students. (S/U grading only.)

Professional Courses**300. Reading in the Elementary School (4) III.** The Staff (Merino in charge)

Lecture—3 hours; field work—3 hours. Prerequisite: graduate standing. Principles, procedures, and curriculum materials for teaching of reading. Includes decoding skills with a special emphasis on phonics, comprehension skills, study skills, and reading in the content areas.

301. Reading in the Secondary School (4) I, II. Murphy

Discussion—4 hours. Prerequisite: admission to graduate standing, enrollment in the secondary credential program, or consent of instructor. Principles, procedures, and materials to help secondary school teachers improve the reading competence of students. Strategies for enhancing learning through reading and writing in all disciplines, with special attention to linguistically diverse populations.

302. Language Arts in the Elementary School (2) I. The Staff (Merino in charge)

Lecture—2 hours. Prerequisite: graduate standing. Principles, procedures, and materials for the teaching of oral and written expression, listening skills, drama, and children's literature in elementary schools.

303. Art Education (3) III. The Staff (Merino in charge)

Lecture/discussion—2 hours; laboratory—2 hours. Prerequisite: admission to multiple subject credential program. Understanding the principles of education in the arts through participation. Development of concepts, introduction to media, and techniques suitable for the elementary school with emphasis on cross-discipline exploration.

304A. Teaching in the Elementary Schools (5-8) I. The Staff (Merino in charge)

Lecture—2 hours; seminar—2 hours; student teaching—15-30 hours. Prerequisite: acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in preschool or elementary schools. Selection and organization of teaching materials. Introduction to techniques of diagnosing school achievement of children.

304B. Teaching in the Elementary Schools (5-8) II. The Staff (Merino in charge)

Lecture—2 hours; seminar—2 hours; student teaching—15-30 hours. Prerequisite: course 304A; acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in preschool or elementary schools. Current conceptions of elementary school curriculum, emphasis on contributions from the social, biological, and physical sciences. Emphasis on effective teaching methods.

304C. Teaching in the Elementary Schools (5-8) III. The Staff (Merino in charge)

Lecture—2 hours; seminar—2 hours; student teaching—15-30 hours. Prerequisite: course 304B; acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in preschool or elementary schools. Evaluation of teaching materials including audio-visual aids. Current elementary school curriculum with emphasis on contributions from fine arts and humanities.

***305A. Teaching in the Middle Grades (5-8) I.** The Staff (Merino in charge)

Lecture—2 hours; seminar—2 hours; student teaching—15-30 hours. Prerequisite: acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in middle grades. Current conceptions of the middle-grades curriculum with emphasis on social, biological, and physical sciences. Effective teaching methods.

***305B. Teaching in the Middle Grades (5-8) II.** The Staff (Merino in charge)

Lecture—2 hours; seminar—2 hours; student teaching—15-30 hours. Prerequisite: course 305A; acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in intermediate grades. Selection, organization, and evaluation of teaching materials including audio-visual aids. Effective teaching methods in grades 4-9.

***305C. Teaching in the Middle Grades (5-8) III.** The Staff (Merino in charge)

Lecture—2 hours; seminar—2 hours; student teaching—15-30 hours. Prerequisite: course 305B; acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in junior high school. Current conceptions of the junior high school with emphasis on effective teaching methods, and selection of curriculum materials. Alternative programs.

306A-306B-306C. Teaching in Secondary Schools (5-9) I, II, III. The Staff (Merino in charge)

Seminar—2 hours; student teaching—10-21 hours. Prerequisite: acceptance into teacher education program. Supervised teaching in regular or special education secondary school classrooms. Techniques for classroom communications; constructing goals and objectives; assessment of learning; special problems of adolescents; audio-visual techniques. Must be repeated by undergraduates for a total of 15 units; 21 units by graduates in Physical Education and Music, and 24 units by all other graduate students.

307. Methods in Elementary Science (2) III. Wampler

Lecture/discussion—2 hours. Prerequisite: acceptance into teacher education program. Principles, procedures, and materials for teaching the biological and physical sciences in elementary schools.

308. Methods in Elementary Social Studies (2) III. Wampler
Lecture/discussion—2 hours. Prerequisite: acceptance into a teacher education program. Principles, procedures, and materials for teaching history and the social sciences in elementary schools.

***309. Early Childhood and Kindergarten Education (3) III.** The Staff (Merino in charge)
Lecture—3 hours. Prerequisite: upper division or professional standing. Methods, materials, and history of educational programs for the preschool through primary grades. Development of curriculum methods and materials which stress integration of appropriate subject areas with emotional, social, creative, physical, and cognitive development.

322. Methods in Secondary Social Studies (4) I. The Staff (Merino in charge)
Lecture—4 hours. Prerequisite: acceptance into credential program or consent of instructor. Methods and materials of teaching concepts and thinking skills. Recent developments in applying basic skills to the teaching of social studies.

323A. Physical Science in the Secondary School (3) I. The Staff (Merino in charge)
Laboratory/discussion—2 hours; discussion/laboratory—1 hour. Prerequisite: acceptance into a teacher education program. Activity-based overview of concepts and processes in secondary school physical sciences. Emphasis upon philosophy, appropriate teaching methods, materials, assessment and evaluation of learning.

323B. Life Sciences in the Secondary School (3) II. The Staff (Merino in charge)
Laboratory/discussion—2 hours; discussion/laboratory—1 hour. Prerequisite: acceptance into a teacher education program. Activity-based overview of concepts and processes in secondary school biology and life sciences. Emphasis upon philosophy, appropriate teaching methods, materials, assessment and evaluation of learning, and issues.

324. Teaching Methods in Mathematics (3) II. Dugdale
Lecture—3 hours. Prerequisite: acceptance into a teacher education program; student teaching (concurrently); a mathematics background or consent of instructor. Methods and curriculum for teaching mathematics at the secondary level (grades 9-12). Review of innovative mathematics programs in the State.

***351. Advanced Fieldwork in Bilingual Education: Teaching (3-5) I.** The Staff (Merino in charge)
Seminar—2 hours; field work—3-9 hours. Prerequisite: acceptance into a bilingual education specialist program. Discussion, analysis, and implementation of methods, techniques, and material in the bilingual/cross-cultural classroom, including team teaching with paraprofessionals, implementation of language-use models in the classroom, lesson planning, selection and use of bilingual/cross-cultural materials.

***352. Advanced Fieldwork in Bilingual Education: Evaluation and Supervision (3-5) II.** Merino
Seminar—2 hours; field work—3-9 hours. Prerequisite: upper division standing; acceptance into a bilingual/cross-cultural specialist credential program. Provides opportunity to acquire evaluation and supervisory skills in the field under the supervision of University staff and an experienced program evaluator/supervisor in bilingual/cross-cultural education.

***361A-361B-361C. School Psychology: Introduction (3-3-3) I-II-III.** Sandoval and staff
Seminar—2 hours; fieldwork—3 hours (minimum). Prerequisite: admission to school psychology credential program. History and theory of school psychology. Application of psychological theory to educational problems. Reading and mathematics curriculum for school psychologists. Crisis intervention and counseling in the schools. Fieldwork in schools and other institutions serving children. (S/U grading only.)

***362A-362B-362C. School Psychology: Advanced (3-3-3) I-II-III.** Sandoval, Figueroa, Gandara
Seminar—2 hours; field work—4 hours. Prerequisite: courses 361A-361B-361C, 213, 218, 219. Theory and techniques of school-based mental health consulta-

tion and non-biased assessment. Legal principles related to special education practice and school psychology. Advanced case study techniques. (S/U grading only.)

363A-363B-363C. School Psychology: Internship (8-12) I, II, III. Sandoval, Figueroa, and staff
Seminar—2 hours; internship—18-32 hours. Prerequisite: admission to school psychology credential program; courses 361A-361B-361C, 362A-362B-362C, 213, 218, 219. Individual assessment and program evaluation, mental health consultation, intervention strategies to promote the school learning and adjustment of children. Selected topics in school psychology. (S/U grading only.)

398. Group Study (1-5) I, II, III. The Staff (Director in charge)
(S/U grading only.)

399. Individual Study (1-5) I, II, III. The Staff (Director in charge)
(S/U grading only.)

Education (A Graduate Group)

Jonathan H. Sandoval, Acting Chairperson of the Group

Group Office, 2078 Academic Surge (916-752-0761;
FAX: 916-752-5411)

Faculty. Faculty are drawn from 12 departments in the Colleges of Letters and Science, and of Agriculture and Environmental Sciences.

Graduate Study. The Graduate Group in Education offers programs of study and research leading to the Ph.D. degree. Students may study topics in mathematics education, science education, and language and literacy education including bilingual education. Students may also concentrate in educational/school psychology, educational anthropology, and educational sociology and policy studies. Detailed information regarding graduate study may be obtained by writing the group administrative assistant.

Preparation. Students should have earned an M.A. degree or the equivalent in a discipline relevant to their proposed emphasis program. For example, students applying for the Instructional Studies emphasis in mathematics should have earned the M.A. or M.A.T. degree in mathematics; students applying to the Psychological Studies program should have an M.A. in psychology, or educational psychology.

Graduate Adviser. Consult the Education Graduate Group Office (752-0761).

Courses. See Education for courses.

Education Abroad Program

James Gallant, Ph.D., E.A.P. Campus Director
Program Office, 307 South Hall (916-752-3014)

Programs of Study

The Education Abroad Program (EAP) of the University of California offers students who meet the minimal admission requirements the opportunity to experience a different culture while making progress toward degree objectives. Students interested in the language, literature, art, culture, history, or governmental or social institutions of the countries or areas where study centers are located will gain substantially from first-hand academic and practical experience. The same is true for students of foreign affairs. All stu-

dents, whatever their field of study, will broaden their outlook and gain new skills as the result of study in a foreign country. The academic—and non-academic—debts and credits of participation in the EAP should be weighed carefully prior to departure, however.

Estimated all-inclusive minimum costs for the three- to twelve-month program range from \$3,000 to \$20,000 (varies depending upon the country).

Application

Normally, students participate in the program during their junior year, but a limited number of students may be selected for participation as seniors. A few programs are open to sophomores and to graduate students as well. Students considering study abroad with the EAP should contact the EAP Office early in the fall quarter concerning application and filing deadlines. This is important, as deadlines for some centers, including the United Kingdom and Ireland, are in early November.

Eligibility requirements include:

- At least three regular session quarters completed in residence at UC by the time of participation
- At least 84 quarter units completed by the time of participation, except for specific short-term programs
- At least a 3.0 grade point average for course work completed at UC at the time of application and departure
- In about half of the programs we offer, 2 years (6 quarters) of University-level foreign language (with a 3.0 grade point average) or the equivalent is required, but there are a number of EAP programs that do not require previous knowledge of a second language for participation. Consult the EAP Office for specific requirements.
- An academic plan approved by your major adviser and the campus coordinator
- Endorsement of the Academic Senate Committee on the Education Abroad Program

Application forms are available from the EAP Office. A provisional academic planning form, prepared in consultation with the EAP Adviser and the major adviser, must be submitted along with the completed application to the EAP Office prior to the appropriate deadline. Applications received after the official deadline cannot be considered.

For study abroad during the 1995-96 academic year, the application deadlines are as follows: mid-October for the Japan Global Security Studies spring quarter program; early November for the United Kingdom and Ireland, Japan, and the spring quarter programs in Mexico and Costa Rica; early May for Australia, Brazil, Chile, Mexico-Taxco: Language Program, New Zealand, and the year program in Costa Rica; and mid-to-late January for all other study centers. If you intend to participate in a study program during your senior year, careful advance planning is necessary to make sure that all degree requirements will be met. Consult with your major adviser, the Dean's Office of your college, and the campus EAP coordinator. Information on EAP centers and study programs is listed below.

Students who do not meet the minimal requirements for acceptance (see under Education Abroad in the Introduction section) must consult the Campus Coordinator. Students who will have accumulated more than 145 units prior to the beginning of their planned year of study abroad must receive permission from the Campus Coordinator before submitting an application; the probability of such students being accepted is low.

Selection

The Academic Senate Committee on the Education Abroad Program is intimately involved in the selection of EAP participants on the Davis campus. This committee strongly recommends that prospective participants take appropriate courses dealing with the country of their interest in preparation for the year

abroad. Applicants who are taking or have completed such courses at the time of the campus selection process tend to have an increased probability of receiving the endorsement of the Committee, other factors being equal. Lists of suggested courses and reading materials are available in the EAP Office.

Once the completed application materials have been filed, an applicant will be interviewed by a selection committee consisting of faculty and EAP returnees. Among other things, academic goals, knowledge of the host country and the United States and proficiency in the language of the host country, when applicable, will receive considerable attention during the interviews.

Files of applicants receiving the endorsement of the Senate Committee on EAP are forwarded to the Systemwide Office of the EAP on the Santa Barbara campus, where further selection decisions will be made.

Academic Program

In most situations, students from the University of California live as the students of the host country do, and in some cases students attend the same courses, taught by faculty of the host country in their own language. Thus, language skills are very important. To aid adjustment of UC students to different, often unfamiliar educational practices, tutorials are a part of the academic program of most centers. Tutorials also assist in overcoming language problems and provide cultural background information presupposed in the courses. Tutorials are taught by graduate students or junior staff of the host university and are offered in association with courses in which a sufficient number of UC students have enrolled.

To assist in the adjustment and the academic work of the students, faculty members of the University of California serve as Directors and/or Associate Directors at most of the study centers abroad.

The academic program of each student includes: (1) an intensive preparatory course in the language of the host country (except for the programs in the Australia, Canada, Egypt, Ghana, Hungary, Ireland, and New Zealand, United Kingdom); (2) a full year of academic courses; (3) broad opportunity to audit students within the host university. It is expected that students will complete a minimum of 36 units during the academic year in addition to units earned in the intensive language program.

Graduation Requirements

All prospective applicants, but particularly students who intend to study abroad during their senior year, should plan their course programs for Davis and abroad carefully in order to satisfy University, College, and major requirements for the degree. The provisional planning form is intended to take care of this, but a few potential problems deserve emphasis.

Although units and grade points earned in the EAP are incorporated into the University transcript and GPA, the major departments and programs retain the right to determine which EAP courses will be accepted in satisfaction of major requirements. Several major programs have identified key upper division courses which must be completed in residence at Davis. Major advisers should be consulted early so that the pre-departure program at Davis will be planned appropriately.

All degree candidates must meet the University residence requirement. Students planning to graduate immediately upon completion of participation in the EAP may satisfy residence requirements within the final 45 units preceding entrance into the EAP. Otherwise, subject to prior approval of the major department or program concerned, the requirement may be satisfied as follows: Within the final 90 units earned toward the degree, 35 units must be completed in residence in the student's College or School, 12 units of which must be completed after returning from EAP participation. With this option, no more than 55 units taken abroad may be applied toward the unit requirement for graduation. The applicant's College or School Dean is the source for information on the University residence requirement and additional residence requirements that may be imposed.

Participants who satisfy all degree requirements while abroad and expect to graduate upon completion of the year abroad should file for candidacy to receive the degree in September. Unfortunately, transcripts from abroad take a long time to get to the home campus and are not received in time for EAP returnees to be included on the June degree list. Such returning students may participate in the June commencement ceremony, however.

Study Centers

At any one center, the courses and fields of study open to UC students may be limited. Moreover, each of the host institutions has special areas of excellence and strength. The listing of centers below incorporates selected information concerning these points. More detailed information is available in the flyers describing each of the centers and from the EAP adviser in 307 South Hall.

In addition to the programs listed below, Davis students have access to a variety of study and work abroad opportunities. Information can be obtained at the EAP Office in 307 South Hall.

Europe

Austria. The program is small and is designed to offer an opportunity to pursue a specialized interest to a limited number of highly qualified students. A compulsory intensive language course in Strobl and Vienna precedes the beginning of the academic year. All courses are taught in German.

University of Vienna. Eastern European studies (Balkans, Russia), fine arts (history of art, music, theatre arts), folklore, history.

Vienna University of Economics and Business Administration.

Denmark. A compulsory summer intensive language program precedes the academic year and continues through the fall semester. Instruction is in Danish, though examinations in English may be available. Most students concentrate on their major or a closely related field; independent study under tutorial supervision is expected. Students may also apply to the Summer Intensive Language Program only as a short-term program option.

University of Copenhagen. Broad availability of humanities and social sciences. Programs in communications, economics and international politics, history, linguistics, and medieval studies are of particular interest.

France. A compulsory intensive language course precedes the beginning of the academic year. All courses in the universities are taught in French. UC faculty directors are in residence at Bordeaux, Lyon and Paris.

A new French language program is also available during Fall quarter at the *Centre International d'Etudes Françaises*.

Ecole Normale Supérieure, Paris. Coursework in natural sciences, humanities, French and foreign literature, geography, and social sciences.

Ecole Normale Supérieure at Fontenay-Saint Cloud, Paris Region. Coursework in social sciences and the humanities.

Ecole Polytechnique at Palaiseau, Paris Region. Coursework in natural sciences and mathematics.

University of Bordeaux. Broad areas of the humanities and social sciences. The Institute of Political Science and the Institute of Prehistory (Anthropology) are well known.

University of Grenoble. Mainly in the social sciences through the *Université des Sciences Sociales* (Grenoble II); some humanities. Offerings in anthropology and psychology are limited. Not suitable for physical or life sciences.

University of Lyon. Social sciences, art history; modern languages and linguistics; Arabic studies.

Paris Center for Critical Studies. Film theory, literary criticism, philosophy, theater (literature, criticism, and history), historiography, and limited art history.

Paris Center for Critical Studies. In addition to required core courses in French civilization, students take courses in humanities and social sciences, with emphasis on comparative cultural studies, French language, and critical studies.

University of Toulouse. EAP students take regular university courses at Toulouse I (Social Sciences) and Toulouse II (Humanities). Of particular note are courses in business/management studies, comparative literature, economics, international relations, and political science.

Germany. A compulsory intensive language program precedes the beginning of the academic year. All courses are taught in German.

Language and Society Program. Short Term program will be available for Fall 1995.

Georg-August University, Göttingen. Broad curriculum covering most majors. Excellent science programs, with substantial strength in biology, chemistry, and physics. Space in laboratory courses in biology and psychology may be limited.

Hungary. Eötvös Loránd University, Budapest. A fall semester or a year-long program are offered with an emphasis on Central European studies. Students take courses especially designated for EAP, and the courses are taught in English.

Italy. A compulsory intensive program in language and history precedes the beginning of the academic year. Students who have completed only one year of Italian may become eligible for participation by attending a summer intensive-language program in Italy in order to attain the required third-year level, followed by the normal compulsory intensive-language program in Padua. A UC faculty director resident in Padua administers all EAP programs in Italy. All courses are taught in Italian. A short-term language program will be available spring quarter 1995.

Bocconi University, Milan. This institution offers studies in business administration, economics, management and public administration, with a special emphasis on Italian and European entrepreneurial systems.

University of Bologna. Humanities, social sciences, economics, history.

University of Padua. History of art (including archaeology), Italian literature (including linguistics), and political science (which includes history, social sciences, geography, and demography, as well as political science in the American sense). Sciences are not available for UC students.

University of Venice. Economics, history; history of art. *Scuola Normale Superiore, Pisa.* Medieval and renaissance studies and links to faculty members need to be approved by the host university prior to admission into the program.

Conservatorio di Musica G.B. Martini, Bologna. Individual instruction in music performance; composition; music history. An audition is required for admission.

Accademia delle Belle Arti di Venezia, Venice. Art studio and some art history. Colored slides of portfolio of artistic work and successful completion of entrance examination required for admission.

Il Bisonte International School of Graphic Arts. Etching and lithography for advanced undergraduates. Colored slides of portfolio of etchings must be submitted for admission.

A new short-term Italian language program will be available during Spring Quarter 1995. Additional information will be available summer 1994.

Netherlands. Year or Fall/European Studies semester available.

Spain. A compulsory intensive language program precedes the beginning of the academic year. All instruction is in Spanish.

University of Alcalá de Henares. Spanish language and literature, history and economics.

University of Barcelona. Humanities (with emphasis on Spanish art, history, literature, linguistics) and some social sciences. Courses developed for the Center and taught by the University of Barcelona form the core of the program. EAP students are required

to take at least two regular year-long courses in the University of Barcelona. (This is a cooperative program with the University of Illinois.)

University of Granada. EAP students take at least one university course during the year, and a minimum of four courses for foreigners each semester.

Complutense University of Madrid. Humanities and some social sciences. The core program, developed for the UC Study Center and other American programs, concentrates on Spanish studies in the broadest sense. Core and Study Center courses are taught by Spanish faculty. EAP students are required to take two regular year-long courses in the University of Madrid.

Autonomous University of Barcelona.

Autonomous University of Madrid.

Sweden. Compulsory intensive language course during the summer for students who are not already fluent in Swedish. Language study continues during the fall semester for all students until the student has gained the equivalent of two years of Swedish. Most courses are taught in Swedish, but a few courses offered in English may be available. Fall or year participation.

University of Lund. Broad curriculum. Excellent science programs.

United Kingdom and Ireland. The program, which includes 19 institutions, is administered by a director and associate director located in London. Following selection for participation by the EAP administration, a student must still be accepted by a specific department in one of the host institutions. In many host institutions, the student can pursue studies in that department only. Participating institutions are

England: *University of Birmingham, University of Cambridge, University of East Anglia, University of Essex, Colchester, University of Hull, University of Kent at Canterbury, University of Lancaster, University of Leeds, University of London (Queen Mary and Westfield College), University of Sheffield, University of Sussex, University of Warwick, University of York.* Occasionally, students may be placed on an *ad hoc* basis at other institutions.

Ireland: *University College, Cork, University College, Galway.*

Scotland: *University of Edinburgh, University College, Glasgow, University of St. Andrews, University of Stirling.*

Generally, the host universities offer a broad curriculum that includes most liberal arts majors. Life sciences and physical sciences are available.

Russia. One semester-long (fall only) program available at the *Financial Academy* in Moscow, one of the most prestigious of the new institutions in Russia. Intensive language study at the intermediate or advanced level for at least half of the units earned, and a wide range of area studies courses to choose from. Some coursework will be available in English. Graduate student opportunities will be available for students with advanced Russian language training. Scholarships for graduate students are available.

Middle East

Egypt. All courses are taught in English, except courses in Arabic language and literature.

The American University of Cairo. A broad curriculum offered by the Faculty of Arts and Sciences. All students are required to take at least one year-long course in Arabic. Offerings in science are limited.

Israel. First priority is given to students who have completed at least one year of Hebrew. A compulsory intensive language course in Haifa precedes the beginning of the academic year.

Hebrew University, Jerusalem. Broad curriculum; emphasis on Israel and Middle Eastern studies. UC students enroll in a special program for foreign students, taught in English. The program offers courses in Judaic, Israeli, Middle Eastern studies, and a few courses in the general social sciences and humanities, science and business. Students with command of Hebrew have access to a broad curriculum throughout the Hebrew University.

Asia

Hong Kong. A limited selection of courses is offered in English. Knowledge of Chinese is not required for acceptance; however, all students are required to complete at least two courses in Chinese culture, history, or language prior to departure. A compulsory intensive Cantonese program precedes the beginning of the academic year. All students are required to include 18 units of Mandarin or Cantonese in their annual program.

Chinese University of Hong Kong. Humanities and social sciences, with emphasis on Chinese studies. Art studio and music performance courses are available. (Information about courses to be offered in English is announced only one week before instruction begins.)

India. Instruction is in English. A compulsory intensive language program in conversational Hindi precedes the academic year. Students will take a year-long core program focusing on development in modern India and Indian culture and tradition, as well as continue their study of Hindi. During the second and third quarters, students will also take regular course work at the University of Delhi. Fall semester also available.

University of Delhi. Humanities and social sciences are well represented, with some offerings in fine arts and mathematics.

Jawaharlal Nehru University, New Delhi. EAP students majoring in economics, development studies, environmental studies, political science, and social sciences will find extensive coursework in these areas.

Indonesia. An eight-week summer intensive-language program at *Gadjah Mada University* in Yogyakarta is required for all students. Those with less than two years of University-level Indonesian must then take a ten-week inter-term program of continued study of the language, with additional courses in Indonesian history and culture, taught in English. Students enroll in regular courses at one of five institutions for the second semester. Instruction is in Indonesian; tutorial assistance may be available.

It is possible to apply for the summer intensive language program only and/or fall semester. Students may take more advanced language in subsequent years.

Gadjah Mada University. Agriculture, anthropology, biology, economics, geography, mathematics, philosophy, psychology, political science.

Institute Seni Indonesia (ISI). The Indonesian Institute of the Arts: visual arts, music, dance, theater, fine arts, ethno-musicology.

Akademi Seni Tari Indonesia (ASTI) at Denpasar and Bandung. The Indonesian Dance Institute of Bali: dance, music, and theater.

Japan. A variety of study opportunities are available to UC students. Language requirements vary depending upon the host institution and the academic focus of the program. A summer intensive language course prepares students for year-long programs. The programs are administered by a director located in Tokyo.

Doshisha University, Kyoto. Humanities and social sciences; emphasis on Japanese language and culture. This center serves students having more advanced study of Japanese; at least two, preferably three, years of UC Japanese language study.

Global Security Studies Program, Meiji Gakuin University, Yokohama. This spring quarter program provides students the opportunity to study world peace and security issues. Previous Japanese language study is preferred, but not required.

Inter-University Center for Japanese Language Studies (IUC), Yokohama. This program offers an intensive program of training for graduate students in Japanese language. The prerequisite is two years of university-level Japanese.

International Christian University, Mitaka (Tokyo). Humanities and social sciences; emphasis on Japanese language and intercultural communication. A limited number of courses taught in English are available.

At least one year of university-level Japanese language study is required.

Nagoya University, Nagoya. This program is for graduate level economics students. The academic program includes intensive Japanese language study and research conducted under the supervision of a Japanese professor. The prerequisite is two years of university-level Japanese.

Osaka University, Osaka. Undergraduate students study Japanese language and a set program of economics courses. Instruction is in English during the fall semester and in Japanese during the spring. A minimum of two years of university-level Japanese is required.

Sophia University, Tokyo. Comparative culture studies, Japanese language and literature, history, political science, economics and business are available. Many are taught in English. The prerequisite is one year of university-level Japanese.

Tohoku University, Sendai. This program is primarily for graduate students in most fields with well-developed research projects. Participants will study Japanese language, in addition to working on their research projects under the guidance of a Japanese professor. Graduate study in Engineering may also be available. Undergraduates at the advanced level in Japanese may be able to participate in a language and culture program. The prerequisite is two to three years of university-level Japanese.

Tokyo Institute of Technology. Graduate students proficient in Japanese may do research and take courses in science and engineering.

Korea. Year or summer-plus-fall term with a required six-week intensive language program at Yonsei University. Students who are not fluent in Korean will take courses taught in English at Yonsei's Division of International Education. Courses in art history, business, economics, law, literature, philosophy, political science, and sociology are available.

People's Republic of China. EAP offers a full-year program in Beijing and a fall semester program in Tianjin. Intensive language study in Chinese is the primary emphasis of all programs.

Beijing University of Science and Technology. Students receive a half-year of academic credit and financial support for studying standard Chinese and teaching English to Chinese students. The prerequisite is two years of Chinese language and one course in teaching English as a foreign language.

Nankai University, Tianjin. This fall semester program includes Chinese language study and courses taught in English on Chinese culture and civilization. The prerequisite is one year of college-level Chinese. Students must take an intensive language program in July and August prior to the start of the semester.

Peking University. A year-long program focused on advanced-level instruction in Chinese language and literature. Courses are conducted by the Chinese Language Teaching to Foreigners Division of Peking University. The prerequisite for the program is two years of college-level Chinese.

Taiwan, Republic of China. Students participating in the Chinese Language and Culture Studies program in Taipei receive instruction in the Chinese language and enroll in lecture courses (taught in English) on Chinese culture and society arranged by CSU International Programs. Courses in art history, literature, economics, history and political science are available. Prior course work in Chinese culture, history and language are recommended.

National Taiwan University. (This is a cooperative program with California State University International Programs).

Thailand. An eight-week summer intensive language program at *Chiangmai University* is required for all students. This is followed by a seven-week inter-term program of continued study of the Thai language, with additional courses in Thai history and culture, taught in English. Most students will remain at *Chiangmai University* for the second semester and continue taking courses in Thai language and area studies classes taught in English. Students with sufficient lan-

*Course not offered this academic year.

guage background (more than two years of University-level Thai language) have the option of enrolling at *Chulalongkorn University* in Bangkok for the second semester. Instruction is in Thai, though English-speaking tutors are available.

It is possible to apply for the summer intensive-language program only. Students may take more advanced language courses in subsequent years.

Africa

Ghana. *University of Ghana, Legon-Accra.* Open to undergraduate and graduate students. Instruction is in English. As in the British system, students take a year-long program of study in a single area. End-of-year examinations are given only once and are mandatory for credit to be awarded.

Offerings include humanities and social sciences, with emphasis on African studies. There is a strong program in ethnomusicology.

Latin America

Brazil. Language requirements for admission to this program are: two years of college-level Portuguese or the equivalent; or one year of college Spanish and one year of college Portuguese; or two years of college Spanish and completion of an intensive course in Portuguese *prior to departure*. Since courses are taught in Portuguese, the equivalent of one year of college-level Portuguese is the absolute minimum. A compulsory intensive language course precedes the beginning of regular course work.

Pontifical Catholic University of Rio de Janeiro (PUC-Rio). A semester or year academic program which consists of Portuguese study and regular university courses in a wide range of fields.

Chile. *Catholic University of Chile, Santiago de Chile.* A semester or year program is offered. Courses in Chilean history and society; Spanish language; Latin American development, ecology, and the environment; and interdisciplinary women's studies are available.

University of Chile, Santiago.

Costa Rica. *University of Costa Rica, San Jose.* As is appropriate in this Hemisphere, the academic year extends from early March through December. UC participants leave in January. Applications for participation in this program are due in May for a January departure.

A mandatory intensive language program precedes the academic year. During the academic year, courses in Central American studies (history, literature, political science, etc.) form half of the curriculum, with the remaining courses taken from any of the faculties at the University of Costa Rica.

Costa Rica Tropical Biology Quarter at Monteverde. This spring and fall quarters program provides an unusual opportunity for undergraduates to study and do field research in a tropical cloud forest. Applicants should have completed a year of biology, including one upper division organismal biology course, and should have some background in Spanish language.

Central America

Mexico. *Universidad Nacional Autonoma de Mexico (UNAM), Mexico City.* A compulsory intensive language program precedes the beginning of the school year, augmented by courses in contemporary Mexico (history, art, literature, etc.). Students have the option of spending one semester (two UC quarters) at UNAM, or a full year. All instruction is in Spanish.

Study and Field Experience (SFE) in Mexico. Available for either Fall Quarter or Spring Semester, the SFE program begins in Mexico City with six weeks of intensive language courses and a course on contemporary Mexico. The final weeks of the program are spent doing volunteer work in a community outside of Mexico City to complement formal course work. Students must have completed a minimum of one year of university-level Spanish, or the equivalent, by departure.

Language Program in TAXCO. Winter Quarter or Spring Semester available for language study at the 2nd-year level or advanced.

Summer Intensive Language Quarter in Morelia. This program provides total immersion in Mexican society and Spanish language instruction for students who have completed one year of university-level Spanish before departure. It is not appropriate for advanced students in Spanish.

Canada

Students may enroll for a Fall Semester or a full year. Studies on the major or a closely allied field are expected.

University of British Columbia (UBC), Vancouver. Most academic disciplines are available. Areas of special interest include Pacific Rim and Canadian Studies.

Australia and New Zealand

As is appropriate in the Southern Hemisphere, the academic year extends from the beginning of instruction in late February through the examination period, which ends in early December. UC participants must leave in February, and will be unable to attend classes during the winter term preceding departure. Applications for participation in these programs are due in May for a February departure. The universities follow the British system of higher education.

The Australian program includes the *University of New England* in Armidale; the *University of Queensland* in Brisbane; the *Australian National University* in Canberra; three institutions in the Melbourne area, *University of Melbourne*, *Monash University* and *La Trobe University*; the *University of Sydney*, and the *University of New South Wales* in Sydney; *University of Adelaide* and *Flinders University* in South Australia; and the *University of Wollongong* in Wollongong. A full range of academic programs is available. The Study Center accommodates a limited number of students. A UC faculty member in Melbourne directs all programs.

The New Zealand program includes the *University of Auckland*, *Lincoln College* in Christchurch, the *University of Otago* in Dunedin, *Massey University* in Palmerston North, *Victoria University* in Wellington and the *University of Waikato* in Hamilton. All academic disciplines are available; programs in textiles and a variety of agricultural sciences are of special interest.

Endocrinology (A Graduate Group)

Judith Turgeon, Ph.D., Chairperson of the Group
Group Office, 4136 Medical Sciences-1A (Human
Physiology, 752-3230)

Faculty. The Group includes faculty from the Schools of Medicine, Veterinary Medicine, the California Primate Research Center, and the College of Agricultural and Environmental Sciences.

Graduate Study. The interdepartmental Graduate Group in Endocrinology offers programs of study leading to the M.S. and Ph.D. degrees. Research and instruction are offered in topics ranging from endocrinological processes at the cellular and molecular levels to integrative systemic endocrinology. Graduate students receive a strong background in required basic cellular, biochemical and integrative endocrinology and related course work, plus have the opportunity to select specific fields of emphases such as molecular mechanisms of hormone action, signal transduction, metabolism regulation, growth factors, neuroendocrinology, and reproduction.

Graduate Advisers. Contact the Program Office.

Courses in Endocrinology (EDO)

Graduate Courses

210. Methods in Endocrine Research (4) I, II, III.

The Staff

Laboratory—9 hours; discussion—1 hour. Prerequisite: consent of instructor. Ten-week assignment in endocrinology research laboratory. Individual research problem with emphasis on experimental design and methodological/analytical experience. Exposure to and experience with a range of endocrinology faculty research activities. May be repeated three times for credit. (S/U grading only.)

218. Mammalian Endocrinology and Homeostasis

(4) III. Walsh, Turgeon

Lecture—4 hours. Prerequisite: Biological Sciences 102 and 103, Neurobiology, Physiology and Behavior 110, and consent of instructor. Biochemical, physiological, and regulatory properties of the mammalian endocrine system, both at the cellular and systemic level. Signal transduction mechanisms and hormonal actions. Principles that regulate homeostasis, especially in organ-organ interrelationships, metabolism and minerals, fluids and electrolytes. Reproductive endocrinology.

220. Endocrinology Literature Critique (1) I, II.

Turgeon

Discussion—1 hour. Prerequisite: consent of instructor. Critical reading and evaluation of current original publications in endocrinology. Selected papers will be presented and discussed in detail by faculty and students. May be repeated for credit. (S/U grading only.)

235. Personal Computing in the Life Sciences (3), II. Matthews

Lecture—1 hour; laboratory—6 hours. Prerequisite: consent of instructor. Current and near-future uses of "state-of-the-art" personal computers and local area networks. Applications in the Life Sciences. Running programs on Macintosh IIX and 80386-based PC-compatible computers and on 3-Com local area network in Endocrinology Graduate Group Computer Laboratory.

240. Biochemical Endocrinology (3) III. Adams

Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Examination of recent advances in biochemical endocrinology and molecular and cell biology of endocrine systems with emphasis on processes of hormone and receptor synthesis, second messenger phenomena, and hormonal control of gene expression.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour. Prerequisite: consent of instructor. Discussion and critical evaluation of advanced topics and current trends in research in endocrinology. May be repeated for credit.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor.

299. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
(S/U grading only.)

Endocrinology and Metabolism

See Internal Medicine in
Medicine, School of

Engineering

(College of Engineering)

M. S. Ghausi, Ph.D., Dean

Benjamin J. McCoy, Ph.D., Associate Dean—
Research

Zuhair A. Munir, Ph.D., Associate Dean—Graduate
Studies

James F. Shackelford, Ph.D., Associate Dean—
Undergraduate Studies

Billy Sanders, Ph.D., Assistant Dean—Academic
Affairs

College Office, 1050 Engineering II (916-752-0553)

Undergraduate Study

Fourteen undergraduate engineering curricula, including four formal double-major programs, are offered. Each of these is a four-year program leading to the degree of Bachelor of Science. The Chemical, Civil, Electrical, Mechanical Engineering, Aeronautical Science and Engineering, and Computer Science and Engineering curricula are six programs which have been accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), the nationally recognized accrediting body for engineering curricula.

The four-year undergraduate program is divided into two parts: the **Lower Division Program** and the **Upper Division Program**.

Graduate Study

See the Graduate Studies section of this catalog. For additional information refer to the *College of Engineering Bulletin*, obtainable from the UCD Bookstore, or phone the Graduate Study Office (916-752-0592).

Lower Division Programs

If you enter the College of Engineering with *fewer than 84* quarter units of credit, follow the lower division program specified for your major.

If you enter the College with 84 or more quarter units of credit, you must fulfill the requirements outlined in the Bachelor's Degree Requirements section of this catalog, under "College of Engineering, Unit Requirements."

Biological and Agricultural Engineering Lower Division Program:

Biological Systems Engineering

Requirements for majors in Biological Systems Engineering only.

	QUARTER USUALLY UNITS	TAKEN
Required Courses		
Calculus—Mathematics 21A-21B-21C-21D.....	16	1-2-3-4
Linear algebra— Mathematics 22A.....	3	5
Differential equations— Mathematics 22B.....	3	6
General physics— Physics 9A-9B-9C.....	12	3-4-5
General chemistry— Chemistry 2A-2B.....	10	2-3
Organic chemistry— Chemistry 8A-8B (or Surveying— Civil Engineering 10).....	6	4-6
Biological Sciences 1A, 1B, 1C.....	15	4-5-6
Biological Systems Engineering 1.....	3	1
Applications of computers— Engineering 5.....	3	2
Circuits—Engineering 17.....	4	6
Statics—Engineering 35.....	3	6
Properties of biological materials— Biological Systems Engineering 75.....	4	5
Expository writing—English 1 or 3, or Com- parative Literature 1, 2, 3, or 4..	4	1

Introduction to public speaking or group communication—Rhetoric and Communication 1 or 3†.....	4	2
Humanities—Social Sciences electives and General Education electives.....	8	1-3
Total Lower Division Units	98	

† Rhetoric and Communication 1 or 3, or an acceptable substitute as approved by the Undergraduate Study Committee of the College of Engineering.

Biological and Agricultural Engineering Lower Division Program: Food Engineering

Requirements for major in Food Engineering.

	QUARTER USUALLY UNITS	TAKEN
Required Courses		
Calculus—Mathematics 21A-21B-21C-21D.....	16	1-2-3-4
Linear algebra— Mathematics 22A.....	3	5
Differential equations— Mathematics 22B.....	3	6
General physics— Physics 9A-9B-9C.....	12	3-4-5
General chemistry— Chemistry 2A-2B-2C.....	15	1-2-3
Organic chemistry— Chemistry 8A-8B.....	6	4-5
Biological Sciences 1A.....	5	4
Applications of computers— Engineering 5.....	3	2
Circuits—Engineering 17.....	4	6
Statics—Engineering 35.....	3	6
Properties of biological materials— Biological Systems Engineering 75.....	4	5
Expository writing—English 1 or 3, or Comparative Literature 1, 2, 3, or 4.....	4	1
Introduction to public speaking or group communication—Rhetoric and Communication 1 or 3†.....	4	2
Humanities—Social Sciences electives and General Education electives.....	12	3-6
Total Lower Division Units	94	

† Rhetoric and Communication 1 or 3, or an acceptable substitute as approved by the Undergraduate Study Committee of the College of Engineering.

Chemical Engineering and Materials Science Lower Division Program

Requirements for majors in Chemical Engineering, Materials Science, and the double majors, Chemical Engineering/Materials Science and Engineering and Chemical Engineering/Biochemical Engineering, only.

	QUARTER USUALLY UNITS	TAKEN
Calculus—Mathematics 21A-21B-21C-21D.....	16	1-2-3-4
Linear algebra—Mathematics 22A.....	3	5
Differential equations— Mathematics 22B.....	3	6
General Physics— Physics 9A-9B-9C.....	12	3-4-5
General Chemistry—Chemistry 2A, 2B, 2C (Chemistry 2AH, 2BH, 2CH strongly recommended).....	15	1-2-3
Organic Chemistry—Chemistry 128A, 128B.....	6	4-5
Organic Chemistry laboratory— Chemistry 129A.....	2	4
Biological Science 1A.....	5	6
(required only for Chemical/ Biochemical majors)		

*Course not offered this academic year.

Engineering—Applications of computers—Engineering 5.....	3	2 or 5
Circuits—Engineering 17.....	4	6
Statics—Engineering 35.....	3	5
Properties of materials—Engineering 45 (required only for Materials Science and Chemical Engineering/Materials Science and Engineering majors)....	0 or 4	6
Expository writing—English 1 or 3, or Comparative Literature 1, 2, 3 or 4.....	4	2 or 3
Introduction to public speaking or group communication, Rhetoric and Communication 1 or 3†.....	4	2 or 3
Humanities—Social Sciences electives and/or General Education electives.....	16	
Total Lower Division Units	91-96	

† Rhetoric and Communication 1 or 3, or an acceptable substitute as approved by the Undergraduate Study Committee of the College of Engineering.

Civil Engineering Lower Division Program

Requirements for Civil Engineering and the double major, Civil Engineering/Materials Science and Engineering, only.

	QUARTER USUALLY UNITS	TAKEN
Required Courses		
Calculus—Mathematics 21A-21B-21C-21D.....	16	1-2-3-4
Linear algebra— Mathematics 22A.....	3	5
Differential equations— Mathematics 22B.....	3	6
General physics—Physics 9A-9B-9C-9D.....	16	3-4-5-6
(Students majoring in Civil Engineering or Civil Engineering/Materials Science and Engineering are required to complete 12 units of physics including Physics 9A, 9B and 9C. In addition, either Physics 9D, Chemistry 2C or 2CH, Biological Science 1A or Geology 50-50L is required.)		
General chemistry—Chemistry 2A-2B or 2AH-2BH.....	10	2-3 or 4-5
Introduction to engineering systems—Engineering 3.....	3	1 or 2
(Engineering 3 is designed for freshman students. More advanced students may petition to substitute 3 units of technical electives for Engineering 3.)		
Engineering graphics in design— Engineering 4.....	3	1 or 2
Applications of computers— Engineering 5.....	3	2 or 3
Introduction to Surveying— Civil Engineering 10.....	3	3 or 6
Circuits—Engineering 17.....	4	5
Statics—Engineering 35.....	3	4 or 5
Dynamics—Engineering 36.....	3	5 or 6
Properties of materials— Engineering 45.....	4	4 or 6
Expository writing—English 1 or 3, or Comparative Literature 1, 2, 3 or 4.....	4	1 or 2
Introduction to public speaking or group communication— Rhetoric and Communication 1 or 3†.....	4	6
Humanities—Social Sciences electives and/or General Education electives.....	8	
Total Lower Division Units	90	

† Rhetoric and Communication 1 or 3, or an acceptable substitute as approved by the Undergraduate Study Committee of the College of Engineering.

Computer Science and Engineering Lower Division Program

Requirements for Computer Science and Engineering majors only.

	UNITS	QUARTER USUALLY TAKEN
Required Courses		
Calculus—Mathematics		
21A, 21B, 21C, 21D.....	16	1-2-3-4
Linear Algebra—Mathematics 22A.....	3	5
Differential Equations—		
Mathematics 22B.....	3	6
General Physics—Physics		
9A, 9B, 9C, 9D.....	16	3-4-5-6
General Chemistry—Chemistry		
2A.....	5	1 or 2
Introductory Programming—		
Computer Science Engineering		
30 or 35.....	4	1 or 2
Software Development—		
Computer Science		
Engineering 40.....	4	2 or 3
Computer Structure & Assembly		
Language—Computer Science		
Engineering 50 or Electrical		
and Computer Engineering 70...4	4	2 or 3
Circuits—Engineering 17.....	4	6
Statics—Engineering 35.....	3	4 or 5
Properties of Materials—		
Engineering 45.....	4	4 or 5
Expository Writing—English 1 or 3		
or Comparative Literature		
1, 2, 3, or 4.....	4	1 or 2
Public Speaking or Group		
Communication—Rhetoric and		
Communication 1 or 3†.....	4	4, 5, or 6
Humanities—Social Sciences/		
General Education Electives ...12	12	
Unrestricted Elective.....	3	2 or 3
Total Lower Division Units	89	

† Rhetoric and Communication 1 or 3, or an acceptable substitute as approved by the Undergraduate Study Committee of the College of Engineering.

Electrical and Computer Engineering Lower Division Program

Requirements for Electrical Engineering, Computer Engineering, and Electrical Engineering/Materials Science and Engineering majors only.

	UNITS	QUARTER USUALLY TAKEN
Required Courses		
Calculus—Mathematics		
21A, 21B, 21C, 21D.....	16	1-2-3-4
Linear Algebra—Mathematics 22A...3	3	5
Differential Equations—		
Mathematics 22B.....	3	6
General Physics—		
Physics 9A, 9B, 9C.....	12	3-4-5
General Chemistry—		
Chemistry 2A.....	5	1 or 2
General Chemistry (required for		
Electrical Engineering/Materials Science		
and Engineering majors only)—		
Chemistry 2B.....	5	2 or 3
Introductory Programming—		
Computer Science Engineering		
30 or 35.....	4	1 or 2
Software Development—		
Computer Science Engineering		
40.....	4	2 or 3
Computer Structure & Assembly		
Language—Electrical and		
Computer Engineering 70 or		
Computer Science		
Engineering 50.....	4	2 or 3
Circuits—Engineering 17.....	4	6
Statics—Engineering 35.....	3	4 or 5
Dynamics—Engineering 36.....	3	5 or 6

Properties of Materials—		
Engineering 45.....	4	4, 5, or 6
Expository Writing—English 1 or 3		
or Comparative Literature 1, 2,		
3, or 4.....	4	1 or 2
Public Speaking or Group		
Communication—Rhetoric		
and Communication 1 or 3†.....	4	4, 5, or 6
Humanities—Social Sciences/		
General Education electives ...12	12	
Unrestricted Electives (for Electrical		
Engineering and Computer		
Engineering majors only).....	5	
Total Lower Division Units	90	

† Rhetoric and Communication 1 or 3, or an acceptable substitute as approved by the Undergraduate Study Committee of the College of Engineering.

Mechanical and Aeronautical Engineering Lower Division Program

Requirements for Aeronautical Science and Engineering, Mechanical Engineering, and Mechanical Engineering/Materials Science majors only.

	UNITS	QUARTER USUALLY TAKEN
Required Courses		
Calculus—Mathematics		
21A-21B-21C-21D.....	16	1-2-3-4
Linear algebra—		
Mathematics 22A.....	3	5
Differential equations—		
Mathematics 22B.....	3	6
General physics—Physics		
9A-9B-9C-9D.....	16	3-4-5-6
General chemistry—Chemistry 2A-2B		
or 2AH-2BH.....	10	2-3 or 4-5
Engineering graphics in design—		
Engineering 4.....	3	1 or 2
Applications of computers—		
Engineering 5.....	3	2 or 3
Circuits—Engineering 17.....	4	5 or 6
Aeronautical engineering fundamentals—		
Aeronautical Science and		
Engineering 25 (Required for		
Aeronautical Science and		
Engineering majors).....	3	2
Statics—Engineering 35.....	3	4 or 5
Dynamics—Engineering 36.....	3	5 or 6
Properties of materials—		
Engineering 45.....	4	4 or 6
Manufacturing processes—		
Mechanical Engineering 50 (Required		
for Mechanical Engineering and		
Mechanical/Materials Science and		
Engineering majors).....	3	1, 2, or 3
Expository writing—English 1 or 3,		
or Comparative Literature		
1, 2, 3 or 4.....	4	1 or 2
Introduction to public speaking		
or group communication—		
Rhetoric and		
Communication 1 or 3†.....	4	6
Humanities—Social Sciences and/or		
General Education electives 12	12	
Total Lower Division Units	91	

† Rhetoric and Communication 1 or 3, or an acceptable substitute as approved by the Undergraduate Study Committee of the College of Engineering.

Upper Division Programs

If you have completed the requirements for the lower division program or have entered the College of Engineering with more than 84 quarter units of credit, you should follow the upper division requirements for the major you have selected from the programs that follow.

Aeronautical Science and Engineering

Aeronautical Science and Engineering is the branch of engineering that applies scientific knowledge to the design, manufacture and operation of aircraft. Our Bachelor of Science degree in Aeronautical Science and Engineering is designed to provide a broad background and fundamental education in mathematics, the physical sciences, and the engineering sciences. These fundamentals, when complemented by the required technical courses, prepare you for employment in government or industry, while simultaneously establishing an excellent foundation for graduate studies.

The fundamental disciplines of this branch of engineering apply to all bodies and vehicles whose applied loads are influenced by aerodynamic forces. Within this context, aeronautical engineers are involved with automobiles, trains, ships and submarines, aircraft, rockets and missiles, sports equipment, and a variety of energy systems.

Courses in fundamental engineering principles are supplemented with courses in aircraft propulsion, aerodynamics, performance, stability and control, aircraft preliminary design, aeronautical structures, and aeroelasticity.

A broad range of technical elective courses is available. Some students choose these electives from one area of study in order to begin developing a specialty. Others choose from several areas in order to broaden their background in the sciences and engineering. Typical aeronautical science and engineering specialties include aero-thermodynamics, propulsion systems, aircraft performance, stability and control, aeronautical structures, aeroelasticity, flight testing, or component and mechanism design. While you should consult with your adviser before selecting your technical electives, there are a number of electives that could be recommended to all aeronautical science and engineering students regardless of their chosen area of specialization.

Suggested technical electives:

Aeronautical Science and Engineering 131, 137, 139
Mechanical Engineering 172

Suggested advisers: J.W. Baughn, V.R. Capece, J.J. Chattot, M.M. Hafez, R.A. Hess, L.W. Rehfield, N. Sarigul-Kilji, S.A. Snell, C.P. van Dam, B.R. White.

Aeronautical Science and Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.)

Minimum units required for major: 186.

	UNITS
Subject Areas and Courses	
Electronic circuits—Engineering 100.....	3
Applied mechanics—Engineering 102, 104A,	
104B, 104L.....	10
Applied thermodynamics—Engineering 105A,	
105B, Mechanical Engineering 165.....	10
Fluid mechanics—Engineering 103A, 103B,	
103L.....	7
Aerodynamics—Aeronautical Science and	
Engineering 126, 127.....	8
Aircraft propulsion, performance, stability and	
control—Aeronautical Science and	
Engineering 128, 129, 138A.....	12
Aircraft preliminary design—Aeronautical	
Science and Engineering 130.....	4
Aerospace structures—Aeronautical Science	
and Engineering 133, 135.....	6
Measurement systems—Mechanical	
Engineering 176.....	3
Controls and system analysis—Mechanical	
Engineering 171.....	4
Applied mathematics—Select one course	
from Engineering 180; Applied Science 115	
or Mathematics 128C.....	3
Technical electives.....	13
<i>Strongly recommended:</i> Aeronautical	
Science and Engineering 131, 137, 139;	
Mechanical Engineering 172.	

Recommended: Engineering 102L, 105L, 106, 122, 190, Materials Science and Engineering 140, 142, 148, 155, Mechanical Engineering 150A, 150B, 162, 184A with 184B (both courses must be taken), 186, 187, Electrical and Computer Engineering 150, Applied Science Engineering 115, Civil and Environmental Engineering 131A.

Humanities–Social Sciences electives and/or General Education electives 12

Total Units for Upper Division Program.....95

Biological and Agricultural Engineering: Biological Systems Engineering

Commercial enterprises in plant and animal production, bioengineering, biotechnology, food processing, greenhouses and nurseries, forest production and aquaculture all need engineers with a background in biology. Concern for the environment is creating new engineering opportunities as society strives to maintain a balance within the biosphere. The combination of engineering and biology offers a challenging and socially useful career. Engineers with an understanding of living systems are in increasing demand to create the equipment, processes, and systems for production and use of biological materials.

Students in the Biological Systems Engineering program may select courses from the curriculum according to their interests and future career goals. The program offers a general set of courses in mathematics, physics, chemistry, and basic engineering science that is common to other engineering disciplines. In addition, the sequence provides a basic foundation in biological sciences in preparation for the more advanced Biological Systems Engineering courses where biology and engineering are brought together in the analysis and design of biological systems. The program offers flexibility in the selection of technical electives, ranging from biochemistry to plant and animal production to advanced mechanical design courses. Given the flexibility in the program, you are strongly encouraged to consult a faculty adviser when planning your program and selecting elective courses.

AREAS OF SPECIALIZATION

Although specialization is not required, the Biological Systems Engineering program allows a student to select one of the three following areas: agricultural engineering, aquacultural engineering, or forest engineering. If you want to specialize, you may follow, during your junior and senior years, one of the lists of electives that have been recommended for the three areas mentioned. By taking the set of electives for a specialization, you acquire deeper knowledge in an area of special interest. If you want to specialize in some other area, you should consult a departmental adviser.

Agricultural Engineering is the application of engineering principles to the production, processing, packaging, and use of agricultural materials. The field integrates many traditional engineering disciplines, with special attention to the interface between physical systems and agricultural products. Students can emphasize environmental resource management (soil, water, and air), plant production and greenhouse facilities, animal production and facilities, machinery, electronic systems, energy resources, and process engineering.

Suggested technical electives:

Biological Systems Engineering 114, 125, 132, 145, 175

Engineering 102, 104B

Civil and Environmental Engineering 141

Mechanical Engineering 150A

Soil Science 100

Pomology 102

Vegetable Crops 101

Suggested Advisers: Chancellor, Chen, Delwiche, Giles, Grismer, Hills, Jenkins, Parlange, J. Rumsey, Slaughter, Upadhyaya, Wallender.

Aquacultural Engineers are involved in the design, fabrication and management of equipment and facilities for culturing, harvesting, and handling aquatic plants and animals. Understanding the environmental requirements of cultured organisms is an essential consideration in the design and management of aquaculture operations, and strong foundations in biology and water quality are stressed in the aquacultural engineering specialization.

Suggested technical electives:

Biological Systems Engineering 114, 125, 131, 132, 145, 175

Applied Biological Systems Technology 161, 163

Animal Science 118

Civil and Environmental Engineering 141, 141L, 145

Engineering 102

Wildlife and Fisheries Biology 121

Suggested Advisers: Fridley, Garrett, Piedrahita

Forest Engineering is the application of engineering principles and silvicultural knowledge in the management of forests and forest land. Ecological, aesthetic, and recreational aspects of this renewable natural resource are integrated into systems for the production of wood products. Students study systems and equipment for timber harvesting, forest residue management, reforestation, forest recreational facilities, soil and water control and conservation, forest road development, materials handling, and other phases of forestry. This specialization is administered in cooperation with the Department of Environmental Science, Policy and Management at UC Berkeley. Fall quarter of the junior year is normally spent on the Berkeley campus, following an eight-week summer field course sequence at the UC Forestry Camp near Quincy, California.

Suggested technical electives:

Biological Systems Engineering 114, 115, 116, 125, 129, 156, 171, 172, 173, 177, 183, 185

Environmental Science, Policy and Management

Mechanical Engineering 150A

Geography 106

Soil Science 100

The Forestry Summer Camp courses (Forestry 100A through 100E) are strongly recommended for students in the Forest Engineering specialization.

Suggested advisers: Fridley, Hartsough, Miles.

†Environmental Science, Policy and Management courses offered at UC Berkeley.

Biological Systems Engineering Curriculum

Minimum units required for major: 186

Upper Division Requirements:

UNITS

Subject Areas and Courses

Mathematics/Statistics—Civil and Environmental Engineering 114 3

Engineering Science and Design—Engineering 36, 100, 103A, 104A, 105A, 106 18

Biological Systems Engineering 120, 130, 165, 170A, 170B, 170C 20

Biological and Agricultural Science electives: Select at least seven units from: Animal Science 118; Biological Sciences 102; Environmental Science, Policy and Management 129, 156, 171, 172, 173, 183, 185; Geography 106; Pomology 102; Soil Science 100; Vegetable Crops 101; Wildlife and Fisheries Biology 121 7

Engineering Science electives—Select at least three units from: Biological Systems Engineering 131; Civil and Environmental Engineering 141L; Engineering 102, 104B, 164 or Environmental

Science, Policy and Management 177; and at least three units from: Biological Systems Engineering 115, 175; Engineering 105B; Chemical Engineering 161 or Civil and Environmental Engineering 141 12

Engineering design electives—Select at least twelve units from: Biological Systems Engineering 114, 116, 125, 132, 145; Applied Biological Systems Technology 161, 163 with at least three of the twelve units from Civil and Environmental Engineering 132A, 145 or Mechanical Engineering 150A 12

Humanities–Social Sciences/General Education electives 16

Total Units for Upper Division Program.....88

Master Undergraduate Adviser: Delwiche.

Biological and Agricultural Engineering: Food Engineering

Food engineering is the application of engineering principles and concepts to the handling, storage, processing, packaging, and distribution of food and related products. In addition to engineering principles, the food engineering degree is intended to provide an understanding of the chemical, biochemical, microbiological, and physical characteristics of foods. Concepts of food refrigeration, freezing, thermal processing, drying, and other food operations are studied. The food engineering curriculum is designed to provide a strong foundation in mathematical, physical, biological, and food sciences. Courses are drawn from biological systems engineering, chemical engineering and mechanical engineering to provide methods that account for material and energy expenditures and flows; methods for analyzing and designing processes, equipment and operations (e.g., fluid flow and heat transfer) and methods for predicting, monitoring and controlling performance of operations in a manner most relevant to food and food systems. Like other engineers, food engineers have to deal with chemical, mechanical, and physical design and performance criteria. In addition, they also have to provide products that are safe, nutritious, and convenient to prepare and eat. The goal is to manufacture and distribute quality products that consumers find affordable and acceptable.

The food industry is the largest industrial sector of the U.S. economy, creating many employment opportunities. Food engineers help develop new food products. They also conceive, design and operate food processes, equipment and plants for efficient production of foods with minimal impact on the environment. Food engineers may work for food companies in process research and development, equipment and facilities design, or management of production operations. Research and regulatory positions are also available with state and federal agencies. Summer internships are usually available, and students are encouraged to make use of these opportunities.

Food Engineering Curriculum

Minimum units required for major: 187 or 188.

Upper division requirements.

UNITS

Subject Areas and Courses

Mathematics/Statistics—Agricultural Systems and Environment 120 4

Engineering Science and Design—Biological Systems Engineering 125, 165; Chemical Engineering 150A (or Engineering 103A), 157, 159; Engineering 36, 100, 104A, 105A, 105B, 106; Mechanical Engineering 165 40 (or 39)

Food Engineering—Biological Systems Engineering 130, 131, 132, 170A, 170B, 170C, 175; Biological Sciences 102; Chemistry 107A (or 110A); Food Science and Technology 104, 150, 151 38

Humanities–Social Sciences electives/General Education electives 12

Total Units for Upper Division Program...93 or 94

Chemical Engineering

Chemical Engineers apply the principles of chemistry and engineering to produce useful commodities, ranging from antibiotics to zirconium. Chemical engineers are increasingly concerned with chemical and engineering processes related to the environment, food and pharmaceutical production, and medicine, working in areas as diverse as integrated circuits and integrated waste management. Preparation for a career in chemical engineering requires an understanding of both engineering and chemical principles to develop proficiency in conceiving, designing, and operating new processes.

The Chemical Engineering curriculum has been planned to provide a sound knowledge of engineering and chemical sciences so that you may achieve competence in treating not only current technical problems but also those that will arise in the technologies of the future. In your junior year, you focus your attention on basic engineering courses, particularly thermodynamics, fluid mechanics, and energy transfer. In your senior year, you draw these fundamentals together and apply them in a study of mass transfer phenomena, process design, and process dynamics and control. The program is strengthened and broadened with introductory courses in the electrical and mechanical sciences.

The curriculum includes 12 units of technical electives and 6 units of advanced chemistry electives that allow you to strengthen specific areas in Chemical Engineering, explore new areas, or pursue areas of specialization. The most popular areas of specialization, together with lists of **suggested** technical electives, are identified and discussed in the following paragraphs. Please talk to the instructors of the courses listed about possible prerequisites before enrolling.

The *premedical and prebiomedical engineering* areas of specialization have been specifically designed to prepare the student for graduate work in biomedical engineering or to meet the undergraduate requirements for entrance into medical school. Because of the emphasis on the natural sciences and the application of fluid mechanics, mass transport, heat transfer, thermodynamics, reaction kinetics, and process dynamics to problems in natural science, you are well prepared to understand problems in living systems. Many biological phenomena, such as blood flow, solute transport, and energy exchange, can be dealt with using the theoretical tools you learned as an undergraduate.

AREAS OF SPECIALIZATION:

Applied Chemistry. The Chemical Engineering curriculum includes an important core of chemistry courses. You can take advantage of this background to build a strong program in chemistry by choosing electives from among advanced undergraduate chemistry courses.

Suggested technical electives:
Chemistry 110B, 111, 115, 121, 128C, 129B, 129C, 130, 131, 150

Fiber and Polymer Science 100, 110

Applied Mathematics. The mathematics specialization is designed both to strengthen your understanding of the foundations of engineering science and to improve your ability to treat complex engineering problems. Courses in abstract algebra, advanced calculus, and the theory of differential equations provide a sound theoretical background, while courses in analytical and numerical analysis provide the techniques for solving a wide range of engineering problems.

Suggested technical electives:

Applied Science Engineering 115, 116
Mathematics 118A, 118B, 118C, 119A, 119B, 121A, 121B, 128A, 128B, 128C, 131, 132A, 132B, 185A, 185B

Biochemical Engineering. This area of specialization prepares you to do graduate work in biochemical engineering and to find employment in the biotechnology, pharmaceutical, and food industries.

Suggested technical electives:

Strongly recommended

Microbiology 102, 102L
Biological Sciences 1A, 102
Chemical Engineering 161A, 161B, 161L

Also recommended

Biological Sciences 1B, 101, 103, 104
Biological Systems Engineering 175
Chemical Engineering 170
Food Science and Technology 123, 123L
Microbiology 130A, 130B, 130L
Molecular and Cellular Biology 120L, 123, 160L, 161, 170L
Neurobiology, Physiology and Behavior 100B, 100L
Plant Science 140
Viticulture and Enology 140, 186

Computers and Automation. This specialization offers you the opportunity to master various computational techniques to formulate, solve, and analyze chemical engineering problems. In addition, you are exposed to the theory and practice of monitoring and operating chemical processes using microprocessor-based control systems. The common ingredient in these studies is the use of computers. Development of expert systems for detecting process failures, using computer-aided design (CAD) packages to optimize product yields, solving large numbers of equations on supercomputers to assess transient behavior of processes, and implementation of plantwide control systems are all examples of chemical engineering endeavors based on the extensive use of computers. The following list of elective courses is suggested to help you obtain the necessary background in these areas.

Suggested technical electives:

Artificial Intelligence and Computer Graphics:
Computer Science Engineering 170, 175
Numerical Analysis and Optimization:
Applied Science Engineering 115, 116
Mathematics 128B-C, 168
Civil and Environmental Engineering 153
Automatic Control:
Electrical and Computer Engineering 150, 151, 157B
Mechanical Engineering 176
Food Science and Technology 156

Advanced Materials Processing. Because the manufacture of semiconductor devices, integrated circuits, magnetic memories, tapes, disks, and other devices involves the application of chemical and engineering principles, chemical engineers are finding productive careers in the electronics industry. The electronics processing specialization introduces you to the analysis and design of modern circuits and devices and provides a strong background in the layout and fabrication of such devices.

Suggested technical electives:

Computer Science Engineering 140
Chemical Engineering 163
Electrical and Computer Engineering 145A, 145B, 146A, 146B
Physics 140A, 140B

Energy Conversion and Fuels Processing. This area of specialization is designed to introduce you to energy sources, energy conversion methods, and the manufacture of fuels.

Suggested technical electives:

Biological Systems Engineering 120
Engineering 111, 162
Environmental and Resource Sciences 103
Environmental Studies 167
Mechanical Engineering 161, 162

Environmental Engineering. Many activities of chemical engineers are motivated by environmental protection. This option prepares you to deal with environmental issues by developing knowledge of fundamental chemical and transport phenomena: chemical reaction processes coupled with fluid mechanics, heat transfer, and mass transfer. Such a foundation in basic chemical engineering science, plus the usual chemical engineering analysis and design courses and courses on environmental topics, prepares you to seek employment with industry or government. For

this specialization, six courses should be selected from the following list:

Suggested technical electives:

Air Environment

Strongly recommended

Civil and Environmental Engineering 149

Recommended

Atmospheric Science 121A, 121B, 158
Civil and Environmental Engineering 242A, 242B, 242BL, 244
Environmental Studies 110
Environmental Toxicology 101, 112A, 112B, 131

Water Environment

Strongly recommended

Chemical Engineering 161A, 161B, 161L
Civil and Environmental Engineering 140, 140L, 148A, 148B
Microbiology 102

Recommended

Biological Sciences 102, 103
Civil and Environmental Engineering 147, 240, 243A, 243B, 244, 245, 246, 248A
Environmental Studies 110, 150A, 151
Environmental Toxicology 101, 112A, 112B
Soil Science 102, 107
Water Science 41, 104

Food Process Engineering. This area of specialization prepares you to do graduate work in food science and technology and to work in the food processing industry.

Suggested technical electives:

Strongly recommended

Microbiology 102
Biological Sciences 102, 103
Chemical Engineering 161A, 161B, 161L
Biological Systems Engineering 132
Food Science and Technology 104, 104L, 111

Recommended

Food Science and Technology 150, 150L, 151

Marketing. Specialty chemical and product manufacturers need chemical engineers who have training in market management, which involves the application of economics, psychology, and statistics in market planning and forecasting and in strategically developing and promoting new products.

Suggested technical electives:

Management 250, 251
Agricultural Economics 113, 130, 136
Psychology 183
Statistics 103

Polymer Science. Polymer materials and their applications are dependent on the use of chemical and engineering principles to process such materials to meet the end-use functional and environmental requirements. The polymer science specialization also prepares you for graduate work in the interdisciplinary field of polymer science and engineering.

Suggested technical electives:

Chemistry 108, 128C, 129B, 129C
Fiber and Polymer Science 100, 150

Prebiomedical Engineering. This area of specialization is designed to prepare you for graduate work in biomedical engineering. Early planning of a complete course schedule in consultation with a Chemical Engineering adviser is important to schedule necessary Biological Sciences courses into your program.

Suggested technical electives:

Four to six courses from
Anatomy 100, Biological Sciences 1A, 1B, 1C, 10, 102, 103, 104, Molecular and Cellular Biology 140L, 141, 142, Neurobiology, Physiology and Behavior 101, 111A, 111B, 112, 113, 114.

Premedical. Inclusion of both organic and physical chemistry in the curriculum allows you to complete the premedical requirements while satisfying the requirements of the Chemical Engineering major. If you elect

the premedical (including preveterinary) area of specialization, you should verify the specific preparation requirements with the Health Sciences Advising Office before making a final decision on your electives. To ensure that you have provided room in your program for the necessary biology courses, it is important to prepare a course schedule with a Chemical Engineering adviser early in your freshman year.

Suggested technical electives:

- Anatomy 100
- Chemistry 128C, 129B, 129C
- Six biology or biochemistry courses, such as Biological Sciences 1A, 1B, 1C, 101, 102, 103, 104, Microbiology 102, Molecular and Cellular Biology 140L, 141, 142, 150, Neurobiology, Physiology and Behavior 110, 112, 113, 114.

Chemical Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Minimum units required for major: 187-188.

UNITS

Subject Areas and Courses

- Chemical engineering—Chemical Engineering 150A, 150B, 151, 152A, 152B, 153, 154A, 154B, 155A, 155B, 156A, 156B, 157, 157L, 158A, 158B, 158C, 15961
- Chemistry—Chemistry 110A, 110C6
- Quantum mechanics—Physics 9D or Chemistry 110B4 or 3
- Advanced chemistry electives6
- To be selected from upper division courses in Chemistry, Biochemistry and Biophysics, Chemical Engineering 150C, 161A, 161B, 161L, 163, 166, 170, Civil and Environmental Engineering 140, 140L, Materials Science Engineering 134, 144, 147, Environmental Toxicology 112A-112B, Food Science and Technology 100A-100B, 104, 119, Physiological Sciences 101A-101B, Fiber and Polymer Science 150.
- Technical electives 12
- Humanities—Social Sciences/General Education electives8

Total Units for Upper Division Program96-97

Chemical Engineering/Materials Science and Engineering

Minimum units required for major: 194-195.

UNITS

Subject Areas and Courses

- Chemical engineering—Chemical Engineering 150A, 150B, 151, 152A, 152B, 153, 154A, 154B, 155A, 155B, 156A, 156B, 157, 157L, 158A, 158B, 158C, 15961
- Chemistry—Chemistry 110A, 110C6
- Quantum mechanics—Physics 9D or Chemistry 110B4 or 3
- Materials science—Materials Science and Engineering 130, 132, 134, 138, and two courses chosen from Materials Science and Engineering 140, 142, 144, 146, 147, 148, 155, and three laboratory courses chosen from Materials Science and Engineering 132L, 134L, 138L, 140L, 142L, and 144L21
- Humanities—Social Sciences and/or General Education electives8

Total Units for Upper Division Program ...99-100

Chemical Engineering/Biochemical Engineering

Minimum units required for major: 187

UNITS

Subject Areas and Courses

- Chemical engineering—Chemical Engineering 150A, 150B, 151, 152A, 152B, 153, 154A, 155A, 156A, 157, 157L, 158A, 158B, 158C50

- Biochemical engineering—Biological Sciences 102, Microbiology 102, Chemical Engineering 161A, 161B, 161L17
- Chemistry—Chemistry 110A, 110C6
- Biochemical Engineering electives10
- Choose at least six units of lecture from: Biological Sciences 1B, 101, 103, 104, Biological Systems Engineering 175, Molecular and Cellular Biology 123, Microbiology 130A, Neurobiology, Physiology and Behavior 100B, Viticulture and Enology 140, 186, Chemical Engineering 170.
- Choose at least 4 units of laboratory from: Molecular and Cellular Biology 120L, 160L, Microbiology 102L, Neurobiology, Physiology and Behavior 100L.
- Humanities—Social Sciences electives and/or General Education electives8

Total Units for Upper Division Program91

Materials Science and Engineering

Materials Science and Engineering is directed toward an understanding of the structure, properties, and behavior of materials. Society demands new and improved materials with capabilities far superior to common metals, alloys, and ceramics. New materials are needed for high-speed transportation systems, surgical and dental implants, new generations of power plants, and solid-state electronic devices in computer and communication technology.

Both the development of new materials and the understanding of present-day materials demand a thorough knowledge of basic engineering and scientific principles including crystal structure, elastic and plastic behavior, thermodynamics, phase equilibria and reaction rates, and physical and chemical behavior of engineering materials.

Materials engineers study phenomena found in many different engineering operations, from fracture behavior in automobiles to fatigue behavior in aircraft frames; from corrosion behavior in petro-chemical refineries to radiation-induced damage in nuclear power plants; and from fabrication of steel to design of semiconductors. Materials engineers are also increasingly involved in developing the new materials needed to attain higher efficiencies in existing and proposed energy conversion schemes, and will play a central role in the development of new technologies based on composites and high temperature superconductivity.

The undergraduate program in Materials Science and Engineering provides the background for activities in research, processing, and the design of materials. The curriculum is based on a common core of courses basic to engineering. These courses, taken during your first two years, provide a strong foundation in fundamental engineering concepts. In your third year, you will take "fundamentals" courses (Materials Science and Engineering 130, 132, 134, 138). With this background, you are then ready for the "applications" courses (Materials Science and Engineering 140, 142, 144, 146, 147, 148, 149, 155) during the fourth year.

Technical electives, selected from other engineering or physical and natural science disciplines, give you some degree of specialization at the bachelor's degree level. They also provide preparation for research in a selected area at the graduate level. Twelve technical elective units may be selected to complete the undergraduate Materials Science and Engineering program. By selecting the appropriate technical electives and Humanities and Social Science/General Education electives, you may orient the program to suit your interests and career objectives: production and development, applied research, basic research, teaching, and/or management.

Upper division courses in engineering, chemistry, physics, mathematics, and biological sciences are generally acceptable as technical electives in Materials Science and Engineering.

The following list of suggested areas of specialization is given to assist you and your adviser in the preparation of study lists.

Suggested technical electives:

Aerospace Structures:

- Aeronautical Science and Engineering 130, 133, 135, 137, 139

Automatic Control and Systems Analysis:

- Mechanical Engineering 171, 172, 185, 187, 188
- Electrical and Computer Engineering 157A, 157B, 174

Biomedical Engineering:

- Chemistry 107A, 107B
- Biological Sciences 1A, 1B
- Physiology 111A, 111B, 112, 113
- Physical Education 101, 102

Chemical Corrosion:

- Chemistry 110A, 110B, 110C or 107A, 107B
- Chemical Engineering 151, 152A, 152B

Computers:

- Applied Science Engineering 115
- Computer Science Engineering 110, 122A, 122B, 142, 151A, 151B
- Electrical and Computer Engineering 170, 172, 180A, 180B
- Mathematics 128A, 128B, 168
- Statistics 130A, 130B

Electronic Materials:

- Electrical and Computer Engineering 140A, 140B, 145A, 145B, 146A, 146B, 148
- Materials Science and Engineering 146
- Physics 121, 140A, 140B

Environmental Engineering:

- Engineering 160 (only one unit of credit towards Technical Elective requirement)
- Atmospheric Science 120
- Biochemistry and Biophysics 101A, 101B
- Water Science 41
- Chemistry 8A, 8B
- Civil and Environmental Engineering 149

Heat Transfer:

- Engineering 105B
- Mechanical Engineering 165
- Chemical Engineering 150A, 153

Materials Design and Processing:

- Aeronautical Science and Engineering 137
- Engineering 104B, 106
- Materials Science and Engineering 146, 148, 155
- Mechanical Engineering 150A, 150B, 150L, 151, 152, 185
- Civil and Environmental Engineering 139

Physics of Solids:

- Physics 115A, 115B, 140A, 140B
- Electrical and Computer Engineering 145A, 145B, 148

Suggested advisers: J.C. Gibeling, J.R. Groza, D.G. Howitt, A.K. Mukherjee, Z.A. Munir, S.H. Risbud, J. F. Shackelford.

Materials Science and Engineering

Minimum units required for major: 183.

UNITS

Subject Areas and Courses

- Electronic circuits—Engineering 1003
- Applied mechanics—Engineering 103A, 104A6
- Applied thermodynamics—Engineering 105A, Materials Science and Engineering 1306
- Engineering design elective—select from Aeronautical Science and Engineering 137, 138A, Civil and Environmental Engineering 132A, 132B, 133, Mechanical Engineering 150A, 150B9
- Materials in design—Choose from Materials Science and Engineering 140, 148, 149, 15510
- Measurements and laboratory—Materials Science and Engineering 132L, 134L, 138L, 140L; Mechanical Engineering 1767

*Course not offered this academic year.

- Materials science fundamentals—Materials Science and Engineering 132, 134, 138.....9
- Materials science applications—Select from Materials Science and Engineering 142 (with 142L), 144 (with 144L), 146, 147.....9
- Applied mathematics—Select one course from Engineering 180, 182; Mathematics 131; Statistics 120, 131A; Civil and Environmental Engineering 1143
- Basic science—Select from Chemistry 110A, 110C or Physics 140A, 140B, or Chemistry 128A, 128B, or Physics 121, 122A, or Geology 117A, 117B, or Physiology 110, 110L6
- Technical electives (Engineering 104B recommended)12
- Humanities—Social Sciences electives and/or General Education electives12
- Total Units for Upper Division Program.....92**

Civil and Environmental Engineering

Civil and environmental engineering is devoted to the improvement of the human environment to make our activities productive, safe, and enjoyable, and our surroundings aesthetically pleasing. The profession contributes directly to humanity's continued health and well-being by the planning and design of systems that provide plentiful supplies of potable water; management and control of waste streams; land-water-air transportation; housing and other structures; flood control; and large recreational facilities.

Areas of specialization within civil and environmental engineering include (1) Civil Engineering Planning; (2) Environmental Engineering; (3) Structural Engineering, Structural Mechanics, and Geotechnical Engineering; (4) Transportation Planning and Engineering; and (5) Water Resources Engineering. You may specialize in one or more of these areas by selecting appropriate technical electives. Such specialization is not required. You are urged to consult a faculty adviser when developing your individual program.

Because of the direct concern of professional civil engineers for the quality of human life, you are encouraged to include among your technical electives courses such as Economics 125, Environmental Studies 160 and 166; Political Science 108. Additional information concerning the areas of specialization and suggested courses are given in the following paragraphs.

AREAS OF SPECIALIZATION:

Civil Engineering Planning. Specialization in this area is directed toward the planning of resources utilization and development of projects on an urban or regional scale. Civil engineering planning requires an understanding of the basic principles of engineering, economics, law, planning concepts and techniques, environmental sciences, public administration, and politics. You are encouraged to plan your program early with the aid of a faculty adviser and to complement the suggested technical electives with coursework in the humanities and social sciences.

Suggested technical electives:

- Agricultural Economics 147, 148, 176
- Civil and Environmental Engineering 137, 146, 152, 153, 160, 161, 162
- Economics 125, 130, 131
- Engineering 160 (only one unit of credit towards Technical Elective requirement),
- Environmental Studies 160, 161, 165, 167, 168A, 168B, 171, 173, 179
- Geography 155, 162
- Geology 134
- Political Science 100, 101, 102, 107, 108
- Water Science 150, 154

Suggested advisers: J.R. Lund, P. Mokhtarian, D. Sperling.

Environmental Engineering. Specialists in this area are concerned with improving and maintaining the qualities of the air, land, and water environments that affect our health and well-being in the face of increasing population and expanding industrial activity. The program is firmly based on fundamental science and

civil engineering and emphasizes the design of waterborne, solid, and airborne waste management systems; the design of potable water-supply systems; and environmental monitoring.

Suggested technical electives:

- Atmospheric Science 120, 121A, 121B, 158
- Biological Sciences 102, 103
- Chemical Engineering 154A, 154B, 156A, 156B, 161
- Chemistry 107A, 107B, 110A, 128A, 128B
- Civil and Environmental Engineering 140, 140L, 142L, 144, 145, 146, 147, 148B, 149, 150, 152
- Engineering 180
- Environmental Studies 150A, 150B, 150C, 151, 166
- Mathematics 128A, 128B, 128C
- Mechanical Engineering 161
- Microbiology 102, 105, 130A
- Soil Science 111
- Statistics 130A, 130B

Suggested advisers: D.P.Y. Chang, J. Darby, O.G. Raabe, E.D. Schroeder, G. Tchobanoglous.

Structural Engineering, Structural Mechanics, and Geotechnical Engineering. This area is concerned with the conception, design, analysis, economics, and construction of structures such as buildings, bridges, highways, and dams. Structural Engineering encompasses structures made from metals, reinforced concrete, or timber. Geotechnical Engineering encompasses natural and man-made structures, such as foundations or slopes that are composed of rock or soil. Structural mechanics emphasizes more theoretical aspects of structures, such as mathematical analysis and characterization of material properties.

Suggested technical electives:

- Aeronautical Science and Engineering 135, 137
- Art Studio 121A
- Civil and Environmental Engineering 131B, 132A, 132C, 133, 134, 137, 138, 139, 173, 174, 176
- Engineering 122, 180
- Materials Science and Engineering 138
- Mathematics 128A, 128B, 128C

Suggested advisers: K. Arulanandan, A. Boulanger, R. Chai, Y.F. Dafalias, L.R. Herrmann, I.M. Idriss, B. Kutter, M.R. Ramey, M.M. Rashid, K.M. Romstad.

Transportation Planning and Engineering. Specialists in this area are concerned with the development, coordination, and management of transportation systems for the movement of people and goods in a manner compatible with societal demands. Transportation planning blends knowledge of the basic concepts of engineering, economics, and planning in the development of policies, programs, and projects. Transportation systems engineering blends knowledge of many engineering disciplines in the design, construction, operation, and maintenance of transportation facilities in the form of an integral system. Students should also acquire an awareness of the social sciences and environmental sciences through coursework in these areas.

Suggested technical electives:

- Civil and Environmental Engineering 137, 149, 152, 153, 160, 161, 162, 163
- Engineering 160 (only one unit of credit towards Technical Electives requirement)
- Environmental Studies 167, 168A, 168B, 171, 173, 178, 179

Suggested advisers: P. Jovanis, P. Mokhtarian, D. Sperling.

Water Resources Engineering. This area includes hydrology, hydraulics, and water resources systems planning and design. Hydraulics is concerned with flow in pipe and open-channel water-distribution systems and through hydraulic structures. Water resources system planning and design is concerned with the comprehensive development of water resources for multiple use. Emphasis is placed on principles of planning, analysis, and engineering design and operation as related to the water needs of industry, agriculture, recreation, and other activities.

Suggested technical electives:

- Agricultural Economics 148, 176
- Atmospheric Science 120, 121A, 121B

Civil and Environmental Engineering 142L, 144, 145, 146, 148B, 152, 153

Electrical and Computer Engineering 150A, 150B

Environmental Studies 128, 150A, 151

Geography 162

Water Science 103, 110, 150, 160

Suggested advisers: M.L. Kavvas, I.P. King, B.E. Larock, J.R. Lund, M.A. Mariño, S.G. Schladow.

Civil Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Minimum units required for major: 180.

UNITS

Subject Areas and Courses

- Applied mechanics—Engineering 103A, 104A, 104L.....7
- Applied thermodynamics—Engineering 105A or Chemistry 110A.....3
- Structures—Engineering 104B; Civil and Environmental Engineering 131A.....6
- Soil mechanics—Civil and Environmental Engineering 171,† 171L.....5
- Hydraulics and water resources—Civil and Environmental Engineering 141, 141L, 142.....7
- Environmental—Civil and Environmental Engineering 148A3
- Civil engineering design—Civil and Environmental Engineering 132B; plus any five courses from Civil and Environmental Engineering 132A, 132C, 134, 139, 145, 147, 148B, 150, 152, 162, 173 (must include one from courses 134, 145, 148B, 162, or 173).....18
- Economics—Engineering 1063
- Engineering mathematical analysis—Applied Science Engineering 115; Civil and Environmental Engineering 114, and either Applied Science Engineering 116, Civil and Environmental Engineering 131B or 1539
- Transportation electives—select from Civil and Environmental Engineering 160, 161, or 1633
- Technical electives10
- Six of these units must be selected from engineering courses.
- Humanities—Social Sciences electives and/or General Education electives16

Total Units for Upper Division Program.....90

Civil Engineering/Materials Science and Engineering

Minimum units required for major: 185.

UNITS

Subject Areas and Courses

- Electronic circuits—Engineering 1003
- Applied mechanics—Engineering 103A, 104A, 104L.....7
- Applied thermodynamics—Engineering 105A or Chemistry 110A; Materials Science Engineering 130.....6
- Structures—Engineering 104B; Civil and Environmental Engineering 131A.....6
- Soil mechanics—Civil and Environmental Engineering 171,† 171L5
- Hydraulics and water resources—Civil and Environmental Engineering 141, 141L, 142.....7
- Environmental—Civil and Environmental Engineering 148A3
- Civil engineering design—Civil and Environmental Engineering 132B, plus any three courses from Civil and Environmental Engineering 132A, 132C, 134, 139, 145, 147, 148B, 150, 152, 162, 173 (must include one from Civil and Environmental Engineering 134, 145, 148B, 150, 162 or 173)12
- Economics—Engineering 1063
- Engineering mathematical analysis—Applied Science Engineering 115; Civil and Environmental Engineering 114, and either Applied Science Engineering 116 or Civil and Environmental Engineering 131B or 1539
- Materials science—Materials Science Engineering 132, 132L, 134, 134L, 138, 138L, and two

courses from Materials Science Engineering 140, 142, 144, 147, 148, 155, or Civil and Environmental Engineering 133 18
 Humanities-Social Sciences electives and/or General Education electives 16
 (Civil and Environmental Engineering 137 recommended.)

Total Units for Upper Division Program.....95

†Civil Engineering 10 is a required prerequisite to Civil Engineering 171.

Computer Science and Engineering

The Department of Computer Science administers two curricula: Computer Science and Engineering in the College of Engineering, and Computer Science in the College of Letters and Science. It also administers a minor in the College of Letters and Science. For information on the Computer Science curriculum and minor, see "Computer Science" in this catalog.

The field of Computer Science and Engineering encompasses the organization, design, analysis, theory, programming, and application of digital computers and computing systems. It develops versatile engineers with backgrounds spanning a broad computer hardware/software spectrum.

The Computer Science and Engineering major is designed to provide students with a solid background in mathematics, physics, chemistry, and electronic circuits and systems, all supporting the computer hardware and computer software courses which form the focus of the curriculum. A key theme of this curriculum is the hardware/software interaction in today's computer system design, a theme reflected in the balance between computer hardware and computer software aspects in the course requirements. The key theme of hardware/software interaction is also reflected in the orientation of the courses themselves. The Computer Science and Engineering major also requires additional humanities and social science electives, helping to produce the verbal skills and intellectual breadth demanded by today's employers.

The Computer Science and Engineering program prepares students to do further work in hardware, software, or electronics, either in industry or postgraduate study.

Computer Science and Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.)

Minimum units required for major: 180

UNITS

Required Courses

Professional responsibilities—Engineering 190	3
Electrical engineering background—Electrical and Computer Engineering 100 and 180A	10
Mathematical methods—Computer Science Engineering 100 and Mathematics 131 or Statistics 131A	7
Data structures and algorithms—Computer Science Engineering 110	4
Computer science theory—Computer Science Engineering 120† or 122A†	3
Computer hardware—Computer Science Engineering 152, 154A, 154B, and Electrical and Computer Engineering 172	15
Computer software—Computer Science Engineering 140A, 150‡ or 151A‡, and 160	12
Computer electives—at least 16 units chosen from Computer Science Engineering 120, †, 122A, † 122B, 140B, 142, 150‡, 151A‡, 151B, 158, 163, 165A, 165B, 168, 170, 172, 175, or Electrical and Computer Engineering 180B, and a combined maximum of 3 units from approved Computer Science Engineering 192, 199 and Electrical and Computer Engineering 194	16

Humanities-Social Sciences/General Education electives 21

Total Upper Division Units91

† Completion of both Computer Science Engineering 120 and 122A will satisfy the computer science theory requirement and a computer elective requirement.

‡ Completion of both Computer Science Engineering 150 and 151A will satisfy a portion of the computer software operative system requirement and a computer elective requirement.

Electrical and Computer Engineering

The Department of Electrical and Computer Engineering administers three curricula in the College of Engineering: (1) the Electrical Engineering curriculum, (2) the Computer Engineering curriculum, and (3) the Electrical Engineering/Materials Science curriculum. Double majors are also defined in Electrical Engineering and Computer Engineering, and in Electrical Engineering and Computer Science and Engineering.

Upper division requirements for the degrees in Electrical Engineering, Computer Engineering, and Electrical Engineering/Materials Science are described below. Information on double majors can be obtained from the Electrical and Computer Engineering Department Office.

Computing Majors

There are three computing majors offered within the College of Engineering: (1) Electrical Engineering with a Computers Operation specialty, (2) Computer Engineering, and (3) Computer Science and Engineering.

All three curricula require that 63 of the approximately 90 upper division units be divided into three areas: electronics, computer hardware, and computer software. The Electrical Engineering with a Computer option and Computer Engineering curricula divide these 63 units almost equally between electronics, computer hardware and computer software (with the most flexibility found in the Computer Engineering curriculum). The Computer Science and Engineering curriculum divides these 63 units primarily between computer hardware and computer software.

Because Electrical Engineering is one of the few engineering majors recognized in all fifty states for professional registration, some computer majors wish to pursue a double major in Electrical Engineering and Computer Engineering or in Electrical Engineering and Computer Science and Engineering. Students interested in this option should check with a staff adviser since course selections must be planned very carefully. However, it is possible to obtain a double major in Electrical Engineering and Computer Engineering with only 195 units (15 more than either degree alone) or in Electrical Engineering and Computer Science and Engineering with 217 units.

Electrical Engineering Curriculum

Electrical Engineering involves the design, analysis, and effective use of electrical systems including electronic computers. Electrical systems and computers play a central role in nearly all aspects of modern life, including communications, medicine, education, environmental protection, space exploration, defense, and home entertainment.

The Electrical Engineering curriculum is designed to provide students with a solid background in mathematics, physical sciences, and traditional electrical engineering subjects of (1) electronic circuits and systems, (2) electronic devices and fabrication, (3) computer hardware, (4) computer software, (5) electromagnetics and optics, and (6) communications and control systems. Through the proper choice of 25 units of very flexible design and free electives, it is possible to focus on any of these six specialty areas or to distribute the 25 units of electives among these areas. Students who complete the Electrical Engineering curriculum will obtain a Bachelor of Science in Electrical Engineering, one of the engineering

degrees recognized in all fifty states as eligible for registration as a Professional Engineer.

Electrical Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.)

Minimum units required for major: 180

UNITS

Required Courses

Electrical engineering core—Electrical and Computer Engineering 100, 110A, 130A, 140A, 150A, 180A, plus two courses from 110B†, 130B, 140B, 150B	34
Computer software—Electrical and Computer Engineering 173	4
Thermodynamics—Engineering 105A	3
Probability theory—Statistics 120, 131A, or Mathematics 131	4
Professional responsibilities—Engineering 160, 190 or Applied Science Engineering 137	3
Design electives	18
Select six courses, at least two with laboratories, from:	
Electrical and Computer Engineering 106, 110B†, 111AB (111AB must both be taken together to count as one design elective), 114, 118, 132A, 132B, 132C, 135, 146A, 146B, 157A, 157B, 166, 170, ‡ 172, 174, 180B, 194ABC (194ABC must be taken together to count as one design elective), 195AB (taken together count as one design elective);	
Computer Science Engineering 110, 122B, 140A, 140B, 142, 150, 151A, 151B, 154B, 158, 160, 163, 165A, 165B, 168, 175.	
May also include approved Electrical and Computer Engineering or Computer Science Engineering 192 or 199 courses.	
Mathematics/Science elective—to be selected from the College of Engineering Physical and Biological Science Elective list plus Statistics 32 or any upper-division Mathematics or Statistics course except: Mathematics 128ABC, 160, 164, 168, or Statistics 102, 103, 104, 105, 108, 110, 141	5
Humanities-Social Sciences/General Education electives	12
Unrestricted electives	7
Total Upper Division Units90	

† Electrical and Computer Engineering 110B may not be counted toward both the Electrical Engineering Core requirement and the Electrical Engineering Design Electives.

‡ Electrical Engineering students may substitute Computer Science Engineering 154A for Electrical and Computer Engineering 170.

Computer Engineering

Computer Engineering involves the design, development, analysis, organization, theory, programming, and application of digital computers. It combines many aspects of electronics, computer hardware, and computer software.

The Computer Engineering curriculum is designed to provide students with a solid background in mathematics, physical sciences, and the traditional computer engineering subjects: electronics, computer hardware, and computer software. Here *electronics* refers to the two Electrical Engineering specialty areas (1) electronic circuits and systems and (2) electronic devices and fabrication. The 63 upper division units required in electronics, computer hardware and computer software consist of 13 units in electronics courses, 18 units in computer hardware courses, and 18 units in computer software courses. The remaining 14 units consist of 9 units of design electives and 5 units of unrestricted electives. By carefully selecting these 14 design and unrestricted electives, students can focus on electronics, computer hardware,

or computer software, or distribute these units among the three areas. In comparison to the Electrical Engineering curriculum, the Computer Engineering curriculum requires courses in only four of the six Electrical Engineering areas: (1) electronic circuits and systems, (2) electronic devices and fabrication, (3) computer hardware, and (4) computer software. In comparison to the Computer Science and Engineering curriculum, the Computer Engineering curriculum requires students to take the electronics background necessary to pursue electives in integrated circuit design and offers more flexibility than the Computer Science and Engineering curriculum in the choice of electives. Students who complete the Computer Engineering curriculum will receive a Bachelor of Science in Computer Engineering.

Computer Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.)

Minimum units required for major: 180

UNITS

Required Courses

Electrical engineering core—Electrical and Computer Engineering 100, 110A, 140A, 180A, 180B	23
Computer hardware—Electrical and Computer Engineering 170†, 172	8
Computer software—Electrical and Computer Engineering 173 and Computer Science Engineering 150 or 151A	8
Data structures and algorithms—Computer Science Engineering 110, 122A	7
Mathematical methods—Computer Science Engineering 100, plus one course from: Statistics 120, 131A, or Mathematics 131	7
Thermodynamics—Engineering 105A	3
Professional responsibilities—Engineering 160, 190 or Applied Science Engineering 137	3
Design electives	9
Select three courses from:	
Electrical and Computer Engineering 106, 110B, 111AB (111AB must both be taken to count as one design elective), 114, 118, 132A, 132B, 132C, 135, 146A, 146B, 157A, 157B, 166, 174, 194ABC (194ABC together may count as one design elective), 195AB (taken together count as one design elective);	
Computer Science Engineering 122B, 140A, 140B, 142, 151B, 154B,‡ 158, 160, 163, 165A, 165B, 168, 175.	
May also include approved Electrical and Computer Engineering or Computer Science Engineering 192 or 199 courses.	
Mathematics/Science elective—to be selected from the College of Engineering Physical and Biological Science Elective list plus Statistics 32 or any upper division Mathematics or Statistics course except: Mathematics 128ABC, 160, 164, 168, or Statistics 102, 103, 104, 105, 108, 110, 141	5
Humanities—Social Sciences/General Education electives	12
Unrestricted electives	5
Total Upper Division Units	90

† Computer Science Engineering 154A and 154B may be substituted for the Electrical and Computer Engineering 170 requirement.

‡ No design credit allowed when taken with 154A as substitute for Electrical and Computer Engineering 170.

Electrical Engineering/Materials Science and Engineering

In addition to the Electrical Engineering curriculum described above, the Department of Electrical and Computer Engineering offers a combined major in Electrical Engineering/Materials Science. In the past decade, the fields of solid-state electronics, opto-electronics, magnetics, and superconductors have developed to the point that demand for new materials now sets the pace for progress in these fields. Materials scientists with an electronics background are key to continued progress in these areas. The Electrical Engineering/Materials Science curriculum is designed to provide such a background.

Electronics, magnetics, and superconductors have developed to the point that demand for new materials now sets the pace for progress in these fields. Materials scientists with an electronics background are key to continued progress in these areas. The Electrical Engineering/Materials Science curriculum is designed to provide such a background.

Electrical Engineering/Materials Science and Engineering

Minimum units required for major: 185

UNITS

Required Courses

Electrical engineering core—Electrical and Computer Engineering 100, 110A, 110B, 130A, 130B, 140A, 140B, 150A, 180A	38
Materials science core—Materials Science Engineering 130, 132, 132L, 134, 134L, 146...14	
Engineering science—	
Engineering 104A, 105A	6
Probability theory—Statistics 120, 131A, or Mathematics 131	4
Professional responsibilities—Engineering 160, 190 or Applied Science Engineering 137	3
Design electives	6
Select two courses, at least one of which must be a Materials Science and Engineering course, from the following:	
Electrical and Computer Engineering 106, 111AB (111AB must both be taken to count as one design elective), 114, 118, 132A, 132B, 132C, 135, 146B, 157A, 157B, 166, 170, 172, 173, 174, 180B, 194ABC (194ABC together may count as one design elective), 195AB (195AB taken together count as one design elective);	
Materials Science and Engineering 140, 142, 148, 155.	
May also include approved Electrical and Computer Engineering or Materials Science Engineering 192 or 199 courses.	
Laboratory courses—Materials Science and Engineering 149, Electrical and Computer Engineering 146A	6
Advanced science electives—Geology 117A & 117B, or Physics 104A & 104B, or Physics 121 & 122A, or Chemistry 110A & 110C	6
Humanities—Social Sciences/General Education electives	12
Total Upper Division Units	95

Mechanical Engineering

The mechanical engineer uses basic science in the design and manufacture of complex engineering systems requiring the application of physical and mechanical principles to the development of machines, energy conversion systems, materials, and equipment for guidance and control.

Work in this broad field of engineering requires a thorough knowledge of mathematics, physics, chemistry, fluid mechanics, thermodynamics, heat transfer, mass transfer, electricity, manufacturing processes, properties of materials, and economics.

The Mechanical Engineering curriculum is based on a common core of engineering courses taken in the first two years. You spend your third year in further study of fundamental courses, and in the fourth year you may tailor your studies to your own interests by selecting courses in controls and systems analysis, fluid mechanics, heat transfer, thermodynamics, mechanical design, or materials science. You can either prepare for graduate study in Mechanical Engineering or obtain a broad background for entering engineering practice at the bachelor's level.

You are encouraged to select elective courses from among the areas of specialization listed below.

AREAS OF SPECIALIZATION:

Creative Design. The creation and improvement of products, processes, or systems that are mechanical in nature are the primary activities of a professional

mechanical engineer. The solutions to such major social problems as environmental pollution, lack of mass transportation and raw materials, and energy shortages, will depend heavily on the engineer's ability to create new types of machinery and mechanical systems.

The engineer-designer must have a solid and relatively broad background in the basic physical and engineering sciences and have the ability to solve a variety of problems. In addition to having technical competence, the designer must be able to consider the socioeconomic consequences of a design and its possible impact on the environment. Product safety, reliability, and economics are other considerations.

Suggested technical electives:

Aeronautical Science and Engineering 130, 133, 137, 139

Biological Systems Engineering 165

Applied Science Engineering 115

Engineering 111, 122, 160 (only one unit of credit towards Technical Electives requirement)

Materials Science and Engineering 140, 142, 155

Mechanical Engineering 134, 150B, 151, 152, 161, 162, 172, 184A with 184B (both courses must be taken), 185, 187, 188

Suggested advisers: H.H. Cheng, F.O. Eke, A.A. Frank, J.M. Henderson, M.L. Hull, B. Ravani, S. Velinsky, K. Yamazaki.

Energy Systems. This area is specifically designed for those who would like to work in the fields of power generation, propulsion for transportation, and energy conversion. In these fields, the increased efficiency of systems and the impact of potential environmental pollution are assuming more importance in the design stage.

The program of study is based on the fundamentals of fluid mechanics, thermodynamics, and heat transfer. These fundamentals are applied to combustion engines, gas turbines, heat exchangers, nuclear reactors, fusion powerplants, solar energy systems, and others.

Suggested technical electives:

Aeronautical Science and Engineering 138A

Engineering 160 (only one unit of credit towards Technical Electives requirement)

Mechanical Engineering 162, 186

Suggested advisers: R.C. Aldredge, J.W. Baughn, H. Brandt, V.R. Capece, H.A. Dwyer, M.A. Hoffman, I.M. Kennedy, W. Kollmann, A.A. McKillop, B.D. Shaw.

Manufacturing. Manufacturing is the process of converting raw materials into products. A major activity of mechanical engineers is studying and working with various production methods and techniques, integrating creative design activities into actual fabricated products.

The emphasis in the manufacturing program is to provide hands-on experience with state-of-the-art and computer-integrated manufacturing methods and processes. Laboratories have been established that are equipped with conventional, computer-controlled and nonconventional manufacturing equipment. A manufacturing engineer will have a solid background in manufacturing processes and systems as well as in statistics, design, controls and applications of microprocessors.

Suggested technical electives:

Electrical and Computer Engineering 160, 174

Materials Science and Engineering 140, 155

Mechanical Engineering 50, 151, 153, 172

Suggested advisers: J.R. Groza, J.M. Henderson, B. Ravani, K. Yamazaki

Systems Dynamics and Control. Engineers are increasingly concerned with the performance of integrated dynamics systems in which it is not possible to optimize component parts without considering the overall system.

Systems Dynamics and Control specialists are concerned with the modeling, analysis, and simulation of all types of dynamic systems and with the use of automatic control techniques to change the dynamic characteristics of systems in useful ways. The emphasis

in this program is on the physical systems that are closely related to mechanical engineering, but the techniques for studying these systems apply to social, economic, and other dynamic systems.

Graduate research includes projects on continuously variable transmissions, active and semi-active suspension systems, anti-skid braking systems, electro-mechanical actuator design, design and control of walking machines, electronically controlled steering, mathematical models of motorcycle dynamics, and the analysis of fuel management systems.

An Automotive System Dynamics Laboratory is being developed for testing components such as engines, transmissions, brakes, and steering systems as well as testing completed test vehicles. As plans for on-campus laboratories and a test track proceed, ten experimental vehicles are housed in a rented facility, and research on vehicle components proceeds in various Mechanical Engineering laboratories.

Suggested technical electives:

Aeronautical Science and Engineering 128, 129, 131, 139
Engineering 122

Mechanical Engineering 134, 152, 172, 184A with 184B (both courses must be taken), 187

Suggested advisers: J.W. Brewer, F.O. Eke, A.A. Frank, R.A. Hess, M. Hubbard, D.C. Karnopp, S.A. Snell.

Transportation Systems. An important aspect of Mechanical Engineering is the planning, design, and operation of transportation systems. As society recognizes the increasing importance of optimizing transportation systems to minimize environmental degradation and energy expenditure, engineers will need to consider major innovations in the way people and goods are moved. Such innovations will require competence in vehicle dynamics, propulsion and control, and an understanding of the problems caused by present-day modes of transportation.

Suggested technical electives:

Aeronautical Science and Engineering 127, 128, 129
Civil and Environmental Engineering 131A, 149, 160
Engineering 122, 160 (only one unit of credit towards Technical Electives requirement)

Mechanical Engineering 134, 152, 162, 172, 184A with 184B (both courses must be taken), 187

Suggested advisers: A.A. Frank, M. Hubbard, D.C. Karnopp, D.L. Margolis.

Mechanical Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.)

Minimum units required for major: 180.

UNITS

Subject Areas and Courses

Electronic circuits—Engineering 100.....	3
Applied mechanics—Engineering 102, 104A, 104B.....	9
Applied thermodynamics—Engineering 105A, 105B; Mechanical Engineering 165.....	10
Fluid mechanics—Engineering 103A, 103B.....	6
Mechanical engineering design—Mechanical Engineering 150A, and either 150B or 172; and one course chosen from 184A with 184B (both courses must be taken), 185, 186, 187, 188.....	11
Controls and systems analysis—Mechanical Engineering 171.....	4
Measurements and laboratory—Engineering 102L, 103L, 105L, Mechanical Engineering 176...6	6
Professional responsibilities—Engineering 190.....	3
Applied mathematics—Select one course from: Engineering 180 or 182; Mathematics 131; Statistics 120, 131A; Civil and Environmental Engineering 114.....	3
Technical electives.....	22
Select 12 of the 22 units from upper division Engineering (core), Aeronautical Science and Engineering, Materials Science and Engineering, or Mechanical Engineering courses. To satisfy design requirements, select three courses (of the	

12 units) from the following: Engineering 122, Materials Science and Engineering 140, 148, Aeronautical Science and Engineering 128, 129, 130, 137, 139, Mechanical Engineering 150B, 161, 172, 184A with 184B (both courses must be taken), 185, 186, 187, 188 (if these courses are not used for the core design requirements above), and 134, 151, 152, 162.

Humanities—Social Sciences electives and/or General Education electives.....12

Total Units for Upper Division Program.....89

Mechanical Engineering/Materials Science and Engineering

Minimum units required for major: 185.

UNITS

Subject Areas and Courses

Electronic circuits—Engineering 100.....	3
Applied mechanics—Engineering 102, 104A, 104B.....	9
Applied thermodynamics—Engineering 105A, 105B; Materials Science and Engineering 130; Mechanical Engineering 165.....	13
Fluid mechanics—Engineering 103A, 103B...6	6
Mechanical engineering design—Mechanical Engineering 150A, and either 150B or 172; and one course chosen from 184A with 184B (both courses must be taken), 185, 186, 187, 188.....	11
Controls and systems analysis—Mechanical Engineering 171.....	4
Materials science—Materials Science and Engineering 132, 132L, 134, 134L, 138, 138L, and two courses chosen from Materials Science and Engineering 140, 142, 144, 146, 147, 148, 155.....	18
Measurements and laboratory—Engineering 102L, 103L, 105L, Mechanical Engineering 176...6	6
Applied mathematics—Select one course from: Engineering 180 or 182; Mathematics 131; Statistics 120, 131A; Civil and Environmental Engineering 114.....	3
Professional responsibilities—Engineering 190.....	3
Technical electives.....	6
In order to satisfy design requirements, select two courses must be chosen from Aeronautical Science and Engineering 128, 129, 130, 137, 139, Materials Science and Engineering 140, 148, 149, 155, Mechanical Engineering 150B, 161, 172, 184A with 184B (both courses must be taken), 185, 186, 187, 188 (if these courses are not used for the core design requirement above), 134, 151, 152, 162.	
Humanities—Social Sciences electives and/or General Education electives.....	12
Total Units for Upper Division Program.....	94

Courses in Engineering (ENG)

Lower Division Courses

- 3. Introduction to Engineering Systems** (3) I, II. The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: algebra and trigonometry. Introduction to the engineering profession. General view of the engineering process as obtained by participation in laboratory experiments illustrative of the solution of representative, but greatly simplified, engineering problems. (P/NP grading only.)
- 4. Engineering Graphics in Design** (3) I, II. Henderson, Yamazaki
Lecture—2 hours; laboratory—3 hours. Introduction to engineering design, descriptive geometry, pictorial sketching, computer-aided graphics, and their application in the solution of engineering problems.
- 5. Applications of Computers** (3) I, II, III. The Staff
Lecture—2 hours; discussion—1 hour. Prerequisite: Mathematics 16A or 21A. Digital computation and

computer programming in FORTRAN. Algorithms and their description. Basic programming; debugging of programs; approximate computing-accuracy and significance; solving simple numerical and nonnumerical problems.

11. Issues in Engineering (1) I. Shackelford
Lecture—1 hour; discussion—1 hour. Prerequisite: participation in the Minority Engineering Program (MEP) or consent of instructor. Designed to broaden students' understanding of the engineering profession: its methods, principles, design, and development process; career opportunities; and professional resources.

17. Circuits I (4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 22B (may be taken concurrently); Physics 9C. Basic electric circuit analysis techniques, including electrical quantities and elements, resistive circuits, transient and steady-state responses of RLC circuits, sinusoidal excitation and phasors, and complex frequency and network functions.

***20. The Technological World** (3) II. The Staff
Lecture—3 hours. Prerequisite: high school algebra. The nature of technology; computers and automation; energy systems; engineering design, analysis, and problem solving; metric system; patents and creativity. Technology and social change; technology assessment and technological choices. Intended primarily for students who are not engineering or science majors. Engineering or physical science students may receive only 2 units of credit. General Education credit: Nature and Environment.

25. Introduction to Physical Devices and Systems (2) II. Henderson

Lecture/discussion—1 hour; laboratory—3 hours. Prerequisite: lower division standing in engineering and consent of instructor. Introduction to and experience with common hardware and physical devices with the overall goal of enriching the students' understanding of physical devices and systems.

35. Statics (3) I, II, III. The Staff (Chairperson in charge)
Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 21D (may be taken concurrently); Physics 9A. Force systems and equilibrium conditions with emphasis on engineering problems.

36. Dynamics (3) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 35, Mathematics 21D. Open to College of Engineering students only. Kinematics and kinetics of particles, of systems of particles, and of rigid bodies applied to engineering problems.

45. Properties of Materials (4) I, II, III. The Staff
Lecture—3 hours; laboratory—3 hours. Prerequisite: sophomore student in Engineering. Introductory course on the properties of engineering materials and their relation to the internal structure of materials.

Upper Division Courses

100. Electronic Circuits and Systems (3) II, III. Soderstrand, Suran
Laboratory—3 hours; lecture—1 hour; discussion—1 hour. Prerequisite: course 17. Introduction to analog and digital circuit and system design through hands-on laboratory design projects. Students who have completed Electrical and Computer Engineering 100 may receive only 1.5 units of credit.

102. Intermediate Dynamics (3) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 36, Mathematics 22B; open to College of Engineering students only. Topics in three-dimensional rigid body dynamics; elementary dynamics of vibrating systems; introduction to energy methods.

102L. Dynamics Laboratory (1) II, III. The Staff
Lecture—1 hour; laboratory—1 hour. Prerequisite: course 102 (may be taken concurrently). Experimental laboratory to demonstrate fundamental principles of dynamics and their application to engineering problems. Introduction to instrumentation for dynamic motion measurement.

*Course not offered this academic year.

103A. Elementary Fluid Mechanics (3) I, II, III. The Staff

Lecture—3 hours. Prerequisite: course 36 (may be taken concurrently). Fluid properties; fluid statics; continuity and linear momentum equations for control volumes; flow of incompressible fluids in pipes; dimensional analysis.

103B. Elementary Fluid Mechanics (3) I, II, III. The Staff

Lecture—3 hours. Prerequisite: course 103A; open to College of Engineering students only. Incompressible viscous flow; boundary layer flow; potential flows; compressible flows.

103L. Fluid Mechanics Laboratory (1) II, III. White Lecture—1 hour; discussion—1 hour; laboratory—1 1/2 hours (alternate weeks with course 105L). Prerequisite: course 103B (may be taken concurrently). Basic principles and devices which are common in fluid mechanics are illustrated with a series of experimental demonstrations. Experiments are concerned with flow, pressure and viscosity measurement. Not open for credit to students who have completed Civil Engineering 141L. (P/NP grading only.)

104A. Mechanics of Materials (3) I, II. The Staff Lecture—3 hours. Prerequisite: course 35; Mathematics 22B. Open to Engineering students only. Uniaxial loading and deformation; general concepts of stress-strain-temperature relations and yield criteria; stresses in thin-walled pressure vessels; torsion of shafts; bending of symmetrical beams.

104B. Mechanics of Materials (3) II, III. The Staff Lecture—3 hours. Prerequisite: course 104A. Open to Engineering students only. Deflections due to bending of beams, unsymmetrical bending; application of energy methods to bending problems; yielding and plastic deformation in beams, limit analysis; buckling of columns.

104L. Mechanics of Materials Laboratory (1) II, III. Chai

Laboratory—3 hours. Prerequisite: course 104B (may be taken concurrently). Experiments which illustrate the basic principles and verify the analysis procedures used in the mechanics of materials are performed using the basic tools and techniques of experimental stress analysis.

105A. Thermodynamics (3) I, II, III. The Staff Lecture—3 hours. Prerequisite: Mathematics 21D, 22B; open to College of Engineering students only. Fundamental concepts of thermodynamics: heat energy and work, properties of pure substances, First Law and Second Law for closed and open systems, reversibility, entropy, thermodynamic temperature scales; power cycles: Carnot, Rankine, Brayton; and applications of thermodynamics to engineering systems.

105B. Thermodynamics (3) I, II, III. The Staff Lecture—3 hours. Prerequisite: course 105A; open to College of Engineering students only. Irreversibility and availability, thermodynamic relations, gas and vapor mixtures, and chemical reactions.

105L. Thermodynamics Laboratory (1) II, III. Shaw Lecture—1 hour, discussion—1 hour, and laboratory—1 1/2 hours (alternate weeks with course 103L). Prerequisite: course 105B (may be taken concurrently). Demonstrations and experiments to illustrate the principles of state, the first and second laws of thermodynamics, and thermodynamic cycles. (P/NP grading only.)

106. Engineering Economics (3) II, III. Hartsough, Slaughter

Lecture—3 hours. Prerequisite: upper division standing in Engineering. The analysis of problems in engineering economy; the selection of alternatives; replacement decisions. Compounding, tax, origins and cost of capital, economic life, and risk and uncertainty are applied to methods of selecting most economic alternatives.

111. Electric Power Equipment (3) I, III. Chancellor, Delwiche, Hartsough

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 17. Principles of AC and DC electric motors and generators, their control systems and power sources. Selection of electric power equipment com-

ponents based on their construction features and performance characteristics.

122. Introduction to Mechanical Vibrations (3) I. Hubbard

Lecture—3 hours. Prerequisite: course 102. Free and forced vibrations in lumped-parameter systems with and without damping; vibrations in coupled systems; electromechanical analogs; use of energy conservation principles.

160. Environmental Physics and Society (3) I.

Jungerman, Craig
Lecture—3 hours. Prerequisite: Physics 9D, 5C, or 10 or 1B and Mathematics 16B or the equivalent. Impact of humankind on the environment will be discussed from the point of view of the physical sciences. Calculations based on physical principles will be made, and the resulting policy implications will be considered. (In the College of Engineering, students may receive only one unit of credit towards the Technical Electives requirement.) General Education credit: Contemporary Societies or Nature and Environment. (Same course as Physics 160.)

162. Advanced Energy Technology (4) I. Craig
Lecture—3 hours; discussion—1 hour. Prerequisite: course 105A or consent of instructor. Technical overview of energy technologies. Emphasis on semi-quantitative understanding. About 20 percent of course is policy oriented. Designed to mesh with course 160, which is primarily policy. Offered in alternate years. (P/NP grading only.)

180. Engineering Analysis (3) I. Kollmann
Lecture—3 hours. Prerequisite: Mathematics 22B. Analysis of steady-state and nonsteady-state problems for discrete and continuous systems; analytic and approximate solutions. Typical engineering problems in heat transfer, fluid mechanics, electrical networks, mechanical vibrations, and elasticity.

182. Engineering Analysis in Applied Mechanics (3) III. Brewer

Lecture—3 hours. Prerequisite: course 102 (may be taken concurrently) and Mathematics 22B. Introduction to the mathematics of optimum design. The calculus of variations with applications to dynamics and design. Linearization and the solution of linear dynamic equations. Emphasis on analytical methods and computer aids.

190. Professional Responsibilities of Engineers (3) II, III. Sanders

Lecture—3 hours; laboratory—1 hour. Prerequisite: upper division standing. Organization of the engineering profession; introduction to contracts, specifications, business law, patents, and liability; discussion of professional and ethical issues; oral presentations on the interactions between engineering and society.

Graduate Courses

***254. Manufacturing Engineering** (3) II. Dorf
Lecture—3 hours. Prerequisite: course 160, Statistics 120. Manufacturing and process engineering, productivity, planning, production and operations, inventory and facilities, quality, robots and flexible manufacturing systems.

291. Seminar in Teaching (1) III. The Staff
Seminar—1 hour. Discussion of previous experience as a student and actual practice as a teacher. (S/U grading only.)

Faculty

Meera M. Blattner, Ph.D., Professor
Richard Christensen, Ph.D., Professor
Paul P. Craig, Ph.D., Professor
Stephen P. Cramer, Ph.D., Professor
John S. De Groot, Ph.D., Professor
Roger A. Haas, Ph.D., Professor
William G. Hoover, Ph.D., Professor
David Q. Hwang, Ph.D., Professor
Neville C. Luhmann, Jr., Ph.D., Professor
Nelson Max, Ph.D., Professor
William McCurdy, Ph.D., Professor
Ann Orel, Ph.D., Associate Professor
Garry Rodrigue, Ph.D., Professor
Rao Vemuri, Ph.D., Professor
Frederick Wooten, Ph.D., Professor
Yin Yeh, Ph.D., Professor

Emeriti Faculty

Berni J. Alder, Ph.D., Professor Emeritus
Stewart D. Bloom, Ph.D., Professor Emeritus
John Killeen, Ph.D., Professor Emeritus
William A. Newcomb, Ph.D., Professor Emeritus
Richard F. Post, Ph.D., Professor Emeritus
Wilson K. Talley, Ph.D., Professor Emeritus
Edward Teller, Ph.D., University Professor Emeritus

Courses in Engineering: Applied Science**Davis (EAD)****Lower Division Courses**

90C. Research Group Conference for Lower Division Students (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: lower division standing; consent of instructor. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor and lower division standing. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

115. Introduction to Numerical Methods for Engineers and Scientists (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: Engineering 5, Mathematics 22B. Introduction to error analysis, roots of equations, interpolation, quadrature, eigenproblems, systems of linear algebraic equations, ordinary differential equations, and deterministic and stochastic algorithms. Lectures and computational assignments on the application of digital computers to problems in engineering and science.

116. Computer Solution of Physical Problems (3) III. De Groot
Lecture—3 hours. Prerequisite: course 115 or consent of instructor. Application of computers to solution of physical problems. Numerical solution of elliptic, parabolic, and hyperbolic partial differential equations; eigenvalue problems, Monte Carlo methods, linear programming.

137. Science and Technology of Nuclear Arms Effects and Control (3) I. Jungerman (Physics), Craig

Lecture—3 hours. Prerequisite: upper division standing; one course from Physics 1B, 5C, 9D, or 10. Scientific and technical aspects of nuclear arms effects and nuclear arms control including the nuclear physics of atomic and hydrogen bombs, blast and radiation effects, radioactivity, electromagnetic pulse, ICBM accuracy, laser weapons, verification safeguards, biological and ecological effects. Emphasis on order of magnitude calculations. (Same course as Physics 137.) (In the College of Engineering, students may receive only one unit of credit towards the Technical Electives requirement.) General Education credit: Contemporary Societies or Nature and Environment.

Engineering: Applied Science

(College of Engineering)

Neville C. Luhmann, Jr., Ph.D., Chairperson of the Department

Ann E. Orel, Ph.D., Vice Chairperson of the Department

Department Office, 228 Walker Hall (916-752-0360)

147. Arms Race Technologies and Strategies (3) I. Craig

Lecture—2 hours; discussion—1 hour. Prerequisite: course 137/Physics 137. Technological and strategic issues in the nuclear arms race. Characteristics of nuclear weapons and weapons defense systems; responses and counter-responses. Advantages and disadvantages of alternative realizations of weapons systems.

165A. Quantum Optics I (3) II. Yeh

Lecture—3 hours. Prerequisite: Physics 110A-110B or the equivalent. Quantum nature of light and matter. Statistics of photons in chaotic, coherent and mixed states. Concepts of photon coherence and correlation. Development of a coherent state from a chaotic photon distribution.

165B. Quantum Optics II (3) III. Yeh

Lecture—3 hours. Prerequisite: course 165A or the equivalent. Quantum nature of interaction between light and matter: photoelectric counting statistics. Photon distributions in scattering processes and in nonlinear optical processes.

166A. Quantum Optics Laboratory (1) II. Yeh

Laboratory—3 hours. Prerequisite: course 165A concurrently. Hands on experience in working with lasers, photon spectroscopy, electro-optical devices and photoelectric counting statistics.

166B. Quantum Optics Laboratory (1) III. Yeh

Laboratory—3 hours. Prerequisite: course 165B concurrently. Continuation of course 166A.

180. Introduction to Plasma Physics and Controlled Fusion (3) I. De Groot

Lecture—3 hours. Prerequisite: Physics 110B and 112A, or consent of instructor. Equilibrium plasma properties, plasma sources, plasma diagnostics, magnetohydrodynamics, kinetic theory, plasma stability, plasma confinement systems and approaches to controlled thermonuclear fusion.

181. Plasma Physics Laboratory (1) I. De Groot

Laboratory—3 hours. Prerequisite: course 180 concurrently. Langmuir probes, plasma sources, Landau damping of ion acoustic waves, ion acoustic shocks, ion-ion two-stream instability.

190C. Research Group Conference for Advanced Undergraduates (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: advanced standing; consent of instructor. Weekly conference on research problems, progress and techniques in applied science. May be repeated for credit. (P/NP grading only.)

198. Group Study (1-5) I, II, III. The Staff

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses**228A-228B-228C. Properties of Matter (3-3-3) I-II-III.** Hoover

Lecture—3 hours. Prerequisite: Mathematics 22B and Physics 112B. Microscopic and macroscopic descriptions of matter; thermodynamics and kinetics; constitutive, electrical, mechanical and thermal properties.

230A-230B-230C. Structure of Matter (3-3-3) I-II-III. Yeh

Lecture—3 hours. Prerequisite: courses 205A, 205B, 205C (may be taken concurrently). Classical properties of matter; introduction of quantum mechanics by the correspondence principle; perturbation theory; electron theory of atoms, molecules, and solids; quantum theory of cooperative effects.

234A-234B-234C. Electromagnetic Theory (3-3-3) I-II-III. DeGroot

Lecture—3 hours. Prerequisite: Electrical and Computer Engineering 131B. Review basic electromagnetic field theory. Special relativity. Charges in fields. Radiation from charges: generation, scattering, diffraction. Electrodynamics of continuous media: conductors, dielectrics, superconductors, magnetic materials, plas-

mas. Transmission of electromagnetic waves through material. Modern applications of theory.

271. Optical Methods in Biophysics (3) I. Yeh

Lecture—3 hours. Prerequisite: Physics 110A-110B-110C, Chemistry 110A, 110B, or the equivalent. Physics of light-matter interactions used in biophysical research. Techniques of absorption, ellipsometry, fluorescence, phosphorescence, elastic and inelastic scattering, diffraction, and nonlinear optics are applied to the studies of proteins, nucleic acids, lipids, and supra-molecular organizations in biological systems. Offered in alternate years.

280A-280B-280C. Plasma Physics and Controlled Fusion (3-3-3) I-II-III. De Groot

Lecture—3 hours. Prerequisite: course 234B or consent of instructor. Equilibrium plasma properties; single particle motion; fluid equations; waves and instabilities in a fluid plasma; plasma kinetic theory and transport coefficients; linear and nonlinear Vlasov theory; fluctuations, correlations and radiation; inertial and magnetic confinement systems in controlled fusion.

289A-J. Special Topics in Applied Science (1-5) I, II, III. The Staff

Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in the following areas: (A) Atomic and Molecular Physics; (B) Chemical Physics; (C) Computational Physics; (D) Computer Science; (E) Materials Science; (F) Nuclear Science; (G) Nonlinear Optics; (H) Plasma Physics; (I) Quantum Electronics; (J) Solid State. May be repeated up to a total of 5 units per segment.

290. Seminar (1-2) I, II, III. The Staff

Seminar—1-2 hours. (S/U grading only.)

290C. Graduate Research Group Conference (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: consent of instructor. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff

(S/U grading only.)

299. Research (1-12) I, II, III. The Staff

(S/U grading only.)

Livermore (EAL)**Upper Division Course****199. Special Study for Advanced Undergraduates (1-5) I, II, III.** The Staff

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses**201. Software Engineering (3) I.** Blattner

Lecture—3 hours. Prerequisite: data structures, elementary knowledge of software development methodology; knowledge of an object-oriented language is desirable. First part of course examines the development of large production-quality programs, project management techniques, software design methodologies. The second part covers automated and integrated software tools and object-oriented methods of design. Problems associated with user interface management systems are discussed. (Former course 201A.)

203A. Computer Architecture (3) I. Vemuri

Lecture—3 hours. Prerequisite: course 103 or the equivalent. Detailed design and organization of computer hardware and associated input and output devices. Topics include logic families, addressing methods, memory design, I/O devices, a survey of various architectural structures, and communication systems. A programming project will be performed.

203B. Computer Architecture (3) III. Vemuri

Lecture—3 hours; research paper and programming project. Prerequisite: course 203A. Topics in computer communication, hardware features to enhance operating systems, and advanced architectures.

204A. Artificial Intelligence (3) II. Blattner

Lecture—3 hours. Prerequisite: courses 101, 106, 111. Concepts required to understand artificial intelligence. Goal reduction, exploiting constraints, control mechanisms, and storing common sense knowledge

are introduced. LISP programming language is used. Offered in alternate years.

204B. Knowledge Representation (3) III. Blattner

Lecture—3 hours. Prerequisite: courses 204A, 211, or 212. Representation of knowledge requires some language or communicative medium to describe knowledge about the world. Course explores expressive adequacy, computational efficiency, non-deductive and non-monotonic reasoning associated with some knowledge representation schemes. Offered in alternate years.

205A. Mathematical Methods (3) I. Rodrigue

Lecture—3 hours. Prerequisite: calculus. Complex variables, theory of convergence, evaluation of definite integrals, factorial function (gamma function), asymptotic expansions, fourier analysis.

205B. Mathematical Methods (3) II. Rodrigue

Lecture—3 hours. Prerequisite: course 205A. Laplace transforms, Sturm-Liouville theory, solution of second order linear ODE, approximate solutions of ODE, calculus of variations, characteristics.

205C. Mathematical Methods (3) III. Rodrigue

Lecture—3 hours. Prerequisite: course 205B. Spherical harmonics, Bessel functions, conformal mapping, hypergeometric functions, elliptic functions.

206. Programming Languages (3) III. The Staff

Lecture—3 hours; programming project. Prerequisite: course 106 or the equivalent. Examines topics in language design as the contour model and binding times, abstract data types, functional languages, and syntax analysis.

207. Compiler Construction (3) I. The Staff

Lecture—3 hours. Prerequisite: course 206. Syntax-directed translation techniques are used to implement a compiler for a block-structured, high-level programming language. Emphasis given to semantic analysis and code generation.

208A. Operating Systems I (3) I. The Staff

Lecture—3 hours. Prerequisite: courses 108, 203B. Design of an operating system. Emphasis given to mechanisms commonly used to implement systems and the various policy options. Course stresses the Kernel design approach.

208B. Operating Systems II (3) II. The Staff

Lecture—3 hours. Prerequisite: course 208A. Concentration on operating system structure, interprocess communication, and issues of naming, error control, protection, synchronization, abstract object representation and encoding, resource management, and measurement in distributed operating systems. Course integrates design goals, problems, and mechanisms.

210A. Numerical Methods in Applied Science (3) I. The Staff

Lecture—3 hours. Prerequisite: calculus through differential equations and vector analysis. Numerical techniques used in a wide variety of applications of digital computers to problems in applied science. Emphasis placed on the common mathematical elements of the techniques developed.

210B. Numerical Methods in Applied Science (3) II. The Staff

Lecture—3 hours. Prerequisite: course 210A. Numerical methods applicable to the solution of partial differential equations. Emphasis on finite-difference, finite-element, and spectral methods for linear hyperbolic, parabolic, and elliptic systems and nonlinear hyperbolic systems.

210C. Numerical Methods in Applied Science (3) III. The Staff

Lecture—3 hours. Prerequisite: course 210B. Computational methods in various fields including: fluid mechanics, kinetic theory, solid mechanics, quantum mechanics.

212. Analysis of Algorithms (3) III. The Staff

Lecture—3 hours. Prerequisite: course 111. Investigation of time and space requirements of commonly used programming tasks, such as searching, sorting, set manipulation, and graph algorithms. NP-completeness and intractability also discussed.

213A. Computer Graphics (3) II. Max Lecture—3 hours. Prerequisite: course 113. Development of algorithms for perspective line drawings of three-dimensional objects, as defined by polygons or bicubic patches.

213B. Computer Graphics (3) III. Max Lecture—3 hours. Prerequisite: course 213A. Emphasis on algorithms to produce color-shaded raster renderings of three-dimensional models.

215A. Mathematical Methods in Computer Science (3) II. The Staff

Lecture—3 hours. Prerequisite: course 210A. Mathematical techniques common to advanced computing science and scientific computing. Examination of methods used in statistical analysis and probability theory, with applications to queues and other models.

215B. Mathematical Methods in Computer Science (3) III. The Staff

Lecture—3 hours. Prerequisite: course 215A. Emphasis on the mathematical methods utilized in the study of data structures and computer architecture.

216A-G. Special Topics in Computer Science (1-5) I, II, III.

Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in the following areas: (A) Architecture; (B) Software Systems; (C) Language Translation; (D) Language Design; (E) Operating Systems; (F) Foundations of Computing; (G) Computational Mathematics.

217A-217B. Computational Science (3-3) I, II. The Staff

Lecture—3 hours. Prerequisite: courses 205A and 205B (may be taken concurrently). Designed for physical scientists. Topics in computer science with applications to computational science. Computer organization and architecture, data structures, algorithms and complexity, software environments for scientific visualization, symbolic computation.

218A. Signal Processing (3) I. The Staff

Lecture—3 hours. Prerequisite: Mathematics 185A, 121A-121B. Discrete-time and continuous-time signal processing. Fourier transforms, Laplace transforms, sampling and reconstruction, linear time-invariant systems, signal space concepts, and probability and random processes. Offered in alternate years.

218B. Signal Processing (3) III. The Staff

Lecture—3 hours. Prerequisite: course 218A. Systems and signals, convolution, causality, and stability. Z-transform, DTFT, DFT IIR, and FIR filters. Adaptive filters, array signal processing, spectral estimation, and image processing. Offered in alternate years.

220. Artificial Neural Networks (3) III. Vemuri

Lecture—3 hours. Prerequisite: Mathematics 167. Introduction to artificial neural networks. Content addressable memory, interaction, competition, and resonance. LMS and back propagation algorithms. Comparisons of standard models including perceptrons, multilayered and Hopfield nets. Supervised and unsupervised learning. Offered in alternate years.

222. User Interfaces (3) II. The Staff

Lecture—3 hours. Prerequisite: courses 101, 106. Design and evaluation of the interface between systems and users. Covers user interaction styles and techniques, display formats, user guidance, and methodologies for designing and evaluating user interfaces. Offered in alternate years.

223. Mixed Media Interfaces (3) I. Blattner

Lecture—3 hours. Prerequisite: course 222. Examines basic paradigms of multimedia interfaces and time-varying systems, navigation through the multimedia systems, hypermedia, and an examination of some commercial systems as well as the study of interaction devices such as audio, gesture, video, pen-based systems, and voice input and output. Virtual reality systems are also studied. Offered in alternate years.

224. Theories of Human-Computer Interaction (3) I. Blattner

Lecture—3 hours. Prerequisite: data structures and basic statistics; a course in user interfaces is desirable. Some basic cognitive science pertaining to computer usage is introduced (such as memory, sensory limits, and problem solving) followed by mod-

els of human activity; task analysis; different paradigms for computer use; models of cooperative activity; cultural differences in human-computer interaction; users with disabilities; and adaptive interfaces. Offered in alternate years.

227. Chaos, Fractals and Nonlinear Phenomena (3) III. The Staff

Lecture—3 hours. Prerequisite: courses 205A and 205B. A computational treatment of pervasive instabilities in simulation—"sensitive dependence on initial conditions"—called "chaos." Connecting the Second Law of Thermodynamics to nonlinear dynamics with "strange attractors;" these are generally "fractal" objects with great aesthetic and intellectual appeal.

228A-228B-228C. Statistical Mechanics (3-3-3) I-II-III. Hoover

Lecture—3 hours. Prerequisite: Mathematics 22B and Physics 112B. Microscopic and macroscopic descriptions of matter; thermodynamics and kinetics: constitutive, electrical, mechanical and thermal properties.

230A-230B-230C. Quantum Mechanics (3-3-3) I-II-III. The Staff

Lecture—3 hours. Prerequisite: course 205A-205B-205C. Classical properties of matter; introduction to quantum mechanics by the correspondence principle; perturbation theory; electron theory of atoms, molecules and solids; quantum theory of cooperative efforts.

233A-233B-233C. Theory and Applications of Solid-State Physics (3-3-3) I-II-III. The Staff

Lecture—3 hours. Prerequisite: course 230C or the equivalent. Structure and properties of crystals; theory of dielectrics, metals and alloys; magnetism, superconductivity, and semiconductors. Applications to various solid-state devices.

234A-234B-234C. Electromagnetic Theory (3-3-3) I-II-III. Newcomb

Lecture—3 hours. Prerequisite: Electrical and Computer Engineering 131B. Review basic electromagnetic field theory. Special relativity. Charges in fields. Radiation from charges: generation, scattering, diffraction. Electrodynamics of continuous media: conductors, dielectrics, superconductors, magnetic materials, plasmas. Transmission of electromagnetic waves through material. Modern applications of theory.

255. Classical Mechanics (3) I. Newcomb

Lecture—3 hours. Prerequisite: consent of instructor. General principles of analytical mechanics; variational principles; Lagrange's and Hamilton's equations; kinematics; collisions.

256. Continuum Mechanics (3) II. Christensen

Lecture—3 hours. Prerequisite: course 205C. Hydrodynamics of incompressible and compressible flows in two and three dimensions; problems of hydrodynamic instability; viscous hydrodynamics; boundary layer theory.

257. Magnetohydrodynamics (3) III. Newcomb

Lecture—3 hours. Prerequisite: course 234B. Fundamental MHD equations, MHD waves (both linear and nonlinear), shocks, Lagrangian formulation; theory of stability, gyroscopic effects, finite-resistivity effects.

262A-262B-262C. Atomic and Molecular Interactions (3-3-3) I-II-III. Orel

Lecture—3 hours. Prerequisite: course 230A-230B-230C or the equivalent. Atomic structure and spectra, molecular structure and spectra, classical and quantum mechanical collision theory of electron and heavy particle scattering.

265A-265B. Laser Physics (3-3) I-II. Haas

Lecture—3 hours. Prerequisite: courses 230A-230B-230C, 234A-234B-234C. Theory of generation of laser radiation and its interaction with matter. Dynamics of laser media, oscillators/amplifiers. Short pulse generation and propagation. Coherence properties of laser radiation. Fourier optics, resonators, and holography. Characteristics of laser devices. Laser spectroscopy.

266A-266B. Laser Physics Laboratory (3-3) I-II. The Staff

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 265A-265B (may be taken concurrently). Experiments exploring principles of generation and

propagation of laser radiation. Laser measurement techniques. Dynamics of laser media. Oscillators and amplifiers. Generation of short pulses. Coherence properties of laser radiation. Holography. Characteristics of laser devices. Laser spectroscopy.

267. Nonlinear Optics (3) III. Haas

Lecture—3 hours. Prerequisite: course 265A-265B. Theory of the nonlinear interaction of radiation and matter. Nonlinear optical properties of materials. Crystal optics, electro-optics, and acousto-optics. Parametric oscillation and amplification. Harmonic conversion. Stimulated Raman and Brillouin scattering, self-focusing, four-wave mixing, phase conjugation and spectroscopy.

267L. Nonlinear Optics Laboratory (3) III. Haas

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 265A-265B. Experiments exploring the principles of nonlinear optics. Phenomena studied selected from: crystal-optics, electro-optics, acousto-optics, parametric oscillation and amplification, harmonic conversion, stimulated Raman and Brillouin scattering, self-focusing, four-wave mixing, phase conjugation. Laser spectroscopy.

280A-280B-280C. Plasma Physics and Controlled Fusion (3-3-3) I-II-III. Hwang

Lecture—3 hours. Prerequisite: course 234B or consent of instructor. Equilibrium plasma properties; single particle motion; fluid equations; waves and instabilities in a fluid plasma; plasma kinetic theory and transport coefficients; linear and nonlinear Vlasov theory; fluctuations, correlations and radiation; inertial and magnetic confinement systems in controlled fusion.

289A-J. Special Topics in Applied Science (1-5) I, II, III. The Staff

Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in the following areas: (A) Atomic and Molecular Physics; (B) Chemical Physics; (C) Computational Physics; (D) Computer Science; (E) Materials Science; (F) Nuclear Science; (G) Nonlinear Optics; (H) Plasma Physics; (I) Quantum Electronics; (J) Solid State. May be repeated up to a total of 5 units per segment.

290. Seminar. (1-2) I, II, III. The Staff (Chair in charge)

Seminar—1-2 hours. (S/U grading only.)

290C. Graduate Research Group Conference (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: consent of instructor. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chair in charge) (S/U grading only.)

Engineering: Biological and Agricultural

(College of Engineering)

David J. Hills, Ph.D., Chairperson of the Department

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Faculty

William J. Chancellor, Ph.D., Professor
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Robert B. Fridley, Ph.D., Professor
Roger E. Garrett, Ph.D., Professor
D. Ken Giles, Ph.D., Associate Professor
Mark E. Grismer, Ph.D., Associate Professor
Bruce R. Hartsough, Ph.D., Associate Professor
David J. Hills, Ph.D., Professor
Bryan M. Jenkins, Ph.D., Professor
John M. Krochta, Ph.D., Professor

Miguel A. Mariño, Ph.D., Professor
 Kathryn McCarthy, Ph.D., Assistant Professor
 Michael J. McCarthy, Ph.D., Associate Professor
 R. Larry Merson, Ph.D., Professor
 John A. Miles, Ph.D., Professor
 Ning Pan, Ph.D., Assistant Professor
 Marc B. Parlange, Ph.D., Associate Professor
 Raul H. Piedrahita, Ph.D., Associate Professor
 Richard E. Plant, Ph.D., Professor
 Thomas R. Rumsey, Ph.D., Professor
 R. Paul Singh, Ph.D., Professor
 David C. Slaughter, Ph.D., Assistant Professor
 Henry E. Studer, M.S., Professor
 Shrinivasa K. Upadhyaya, Ph.D., Professor
 Wesley W. Wallender, Ph.D., Professor

Emeriti Faculty

Norman B. Akesson, M.S., Professor Emeritus
 Robert H. Burgy, M.S., Professor Emeritus
 John R. Goss, M.S., Professor Emeritus
 S. Milton Henderson, M.S., Sc.D., Professor Emeritus
 Robert A. Kepner, B.S., Professor Emeritus
 Coby Lorenzen, Jr., M.S., Professor Emeritus
 Stanton R. Morrison, Ph.D., Professor Emeritus
 Michael O'Brien, Ph.D., Professor Emeritus
 Verne H. Scott, Ph.D., Professor Emeritus
 Wesley E. Yates, M.S., Professor Emeritus

Courses in Engineering: Biological Systems (EBS)

Lower Division Courses

1. Introduction to Biological Systems Engineering (3) I. Giles

Lecture—2 hours; laboratory—3 hours. Introduction to engineering and the engineering design process, with examples drawn from the fields of agriculture, biological and food engineering. Emphasis on the relationship of engineering principles to biological systems. Laboratories include small group design projects and presentations.

2. Introduction to Forest Engineering (1) III. Hartsough

Discussion/laboratory—3 hours. Introduction to the engineering aspects of forestry problems, including nursery operations, reforestation, harvesting, log transport, milling and residue utilization. (P/NP grading only.)

75. Properties of Materials in Biological Systems (4) II. Garrett

Lecture—3 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1A; Physics 9C (may be taken concurrently). Properties of typical biological materials; composition and structure with emphasis on the effects of physical and biochemical properties on design of engineered systems; interactions of biological materials with typical engineering materials.

90C. Research Group Conference in Biological Systems Engineering (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: lower division standing in Biological Systems Engineering or Food Engineering; consent of instructor. Research group conference. May be repeated for credit. (P/NP grading only.)

90X. Lower Division Seminar (1-4) I, II, III. The Staff

Seminar—1-4 hours. Prerequisite: consent of instructor. Examination of a special topic in a small group setting.

92. Internship in Biological Systems Engineering (1-5) I, II, III. The Staff (Hills in charge)

Internship. Prerequisite: lower division standing; project approval prior to period of internship. Supervised work experience in biological systems engineering. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Hills in charge)

Prerequisite: consent of instructor. Group study of selected topics; restricted to lower division students. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Hills in charge)

(P/NP grading only.)

Upper Division Courses

114. Principles of Field Machinery Design (3) III. The Staff

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 36, 104A. Traction and stability of vehicles with wheels or tracks. Operating principles of field machines and basic mechanisms used in their design.

115. Forest Engineering (3) III. Hartsough

Lecture—3 hours. Prerequisite: Engineering 104A; Forestry and Resource Management 103, 125 (Berkeley campus). Applications of engineering principles to problems in forestry, including those in forest regeneration, harvesting and transportation.

116. Forest Engineering Field Problems (2) I. Miles

Lecture—1 hour; three weekend field trips to Blodgett Forest. Prerequisite: course 114 or 115. A field study and critical analysis of operations, techniques, and equipment common in forest management, with particular consideration to measurements, data analysis, safety of operations, and maintenance practices.

120. Power Sources and Transmission (4) II. Chen

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 17, 102A, 103A, 105A. Design and performance characteristics of power units: internal combustion engines, electric motors, and hydraulic power systems. Selection and design of power transmission systems for agricultural and industrial applications.

125. Environmental Management of Biological Systems (4) III. Jenkins

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 105A. Fundamentals of heat and mass transfer, psychrometrics, solar radiation, and illumination, including their measurement, and their interactions with plants and animals in controlled environments. Application of fundamental principles to the design of animal and plant production structures and other intensively managed biological systems.

130. Dynamic Modeling of Processes in Biological Systems (3) II. T. Rumsey

Lecture/discussion—3 hours. Prerequisite: Engineering 5 or the equivalent. Introduction to techniques for modeling processes through mass and energy balances, rate equations and equations of state. Analytical and numerical methods for the solution of equations.

131. Fluid Mechanics in Biological Systems (3) III. M. McCarthy

Lecture—3 hours. Prerequisite: Chemical Engineering 150A or Engineering 103A. Introduction to fluid food characteristics, viscoelastic behavior of foods, applications of Bernoulli's equation and macroscopic balances (mass, momentum, mechanical energy) to practical problems in food and biological materials processing. Introduction to turbulent flow and concepts of time averaging. (Not open for credit for students who have taken Chemical Engineering 150B or Engineering 103B.)

132. Unit Operations in Food Engineering (4) III. Singh

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 103A, 105A. Mechanical unit operations applied to such processes as non-Newtonian flow, size reduction, sorting and mixing of granular materials. Thermal operations related to refrigeration, freezing, evaporation and drying of foods.

145. Irrigation and Drainage Systems (4) II. Wallender, Grismer, Hills

Lecture—4 hours. Prerequisite: Engineering 103A or Water Science 142. Engineering and scientific principles applied to the design of surface, sprinkle and micro irrigation systems and drainage systems within economic, biological, and environmental constraints. Interaction between irrigation and drainage will be emphasized. (Same course as Hydrologic Science 115.)

165. Computer Interfacing and Control (4) I. Delwiche

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 100, Engineering 5 or Computer Science Engineering 30. Structured programming in C, digital data acquisition concepts and hardware, analog

input/output systems, driver software, and computer control.

170A. Engineering Design and Professional Responsibilities (3) II. Miles

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 102A, 104A. Introduction to engineering design including professional responsibilities. Emphasis placed on project selection, data sources, specifications, human factors, biological materials, safety systems, and professionalism. Detailed design proposals will be developed for course 170B.

170B. Engineering Projects: Design (3) I, II, III. Miles

Laboratory/discussion—three 2-hour sessions. Prerequisite: course 170A. Individual or group projects involving the design of devices, structures, or systems to solve specific problems in agriculture or forestry. Students may select their projects, subject to approval of instructor.

170C. Engineering Projects: Design Evaluation (3) I, II, III. Miles

Laboratory—three 3-hour sessions. Prerequisite: course 170B strongly recommended. Individual or group projects involving fabrication, assembly and testing of components, devices, structures or systems designed to solve specific problems in agriculture or forestry. Projects selected by the instructor from those designed in course 170B.

175. Rheology of Biological Materials (3) II. K. McCarthy

Lecture—3 hours. Prerequisite: Chemical Engineering 150A or Engineering 103A; and Engineering 105A or Chemical Engineering 152A. Introduction to fluid and solid rheology, viscoelastic behavior of foods and other biological materials, and application of rheological properties to food and biological systems (i.e., pipeline design, extrusion, mixing, coating).

190C. Research Group Conference in Biological Systems Engineering (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: upper division standing in Biological Systems Engineering or Food Engineering; consent of instructor. Research group conference. May be repeated for credit. (P/NP grading only.)

190X. Upper Division Seminar (1-4) I, II, III. The Staff

Seminar—1-4 hours. Prerequisite: consent of instructor. In-depth examination of a special topic in a small group setting.

192. Internship in Biological Systems Engineering (1-5) I, II, III. The Staff (Hills in charge)

Internship. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work experience in biological systems engineering. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Hills in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Hills in charge)

(P/NP grading only.)

Graduate Courses

200. Research Methods in Biological Systems Engineering (2) I. Giles

Lecture—2 hours. Prerequisite: graduate standing. Planning, execution and reporting of research projects. Literature review techniques and proposal preparation. Research funding. Record keeping and patents. Uncertainty analysis in experiments and computations. Graphic analysis. Oral and written presentation of research results, manuscript preparation, submission and review.

215. Soil-Machine Relations in Tillage and Traction (3) I. Chancellor

Lecture—3 hours. Prerequisite: course 114; Civil and Environmental Engineering 171 and Soil Science 100 recommended. Mechanics of interactions between agricultural soils and tillage and traction devices; determination of relevant physical properties of soil;

analyses of stress and strains in soil due to machine-applied loads; experimental and analytical methods for synthesizing characteristics of overall systems.

216. Energy Systems (3) II. Jenkins

Lecture—3 hours. Prerequisite: Engineering 105A. Theory and application of energy systems. System analysis including input-output analysis, energy balances, thermodynamic availability, economics, environmental considerations. Energy conversion systems and devices including cogeneration, heat pump, fuel cell, hydroelectric, wind, photovoltaic, and biomass conversion processes. Offered in alternate years.

***218. Solar Thermal Engineering (3) I.** T. Rumsey

Lecture—3 hours. Prerequisite: course in heat transfer. Familiarity with FORTRAN language. Analysis and design of solar energy collection systems. Sun-earth geometry and estimation of solar radiation. Steady state and dynamic models of solar collectors. Modeling of thermal energy storage devices. Computer simulation. Former course Agricultural Engineering 289D. Offered in alternate years.

***220. Pilot Plant Operations in Aquacultural Engineering (3) III.** Piedrahita

Lecture—1 hour; laboratory—6 hours. Prerequisite: Civil Engineering 243A-243B or Agricultural Engineering Technology 161A-161B. Topics in water treatment as they apply to aquaculture operations. Laboratory study of unit operations in aquaculture. Offered in alternate years.

231. Mass Transfer in Food and Biological Systems (3) II. Krotcha

Lecture/discussion—3 hours. Prerequisite: graduate standing. Application of mass transfer principles to food and biological systems. Study of mass transfer affecting food quality and shelf life. Analysis of mass transfer in polymer films used for coating and packaging foods and controlling release of biologically active compounds. Former course Agricultural Engineering 289C. Offered in alternate years.

233. Analysis of Processing Operations: Drying and Evaporation (3) II. Rumsey

Lecture—3 hours. Prerequisite: course in food or process engineering, familiarity with FORTRAN. Diffusion theory in drying of solids. Analysis of fixed-bed and continuous-flow dryers. Steady-state and dynamic models to predict performance evaporators: multiple effects, mechanical and thermal recompression, control systems.

235. Advanced Analysis of Unit Operations in Food and Biological Engineering (3) II. Rumsey

Lecture—3 hours. Prerequisite: course 132. Analysis and design of food processing operations. Steady state and dynamic heat and mass transfer models for operations involving phase change such as freezing and frying. Separation processes including membrane applications in food and fermentation systems.

***237. Thermal Process Design (3) III.** Merson

Lecture—2 hours; discussion—1 hour. Prerequisite: Food Science and Technology 150 recommended. Heat transfer and biological basis for design of heat sterilization of foods and other biological materials in containers or in bulk. Former course Agricultural Engineering 289B. Offered in alternate years.

***239. Magnetic Resonance Imaging in Biological Systems (3) I.** M. McCarthy

Lecture—3 hours. Prerequisite: graduate standing. Theory and applications of magnetic resonance imaging to biological systems. Classical Bloch model of magnetic resonance. Applications to be studied are drying of fruits, flow of food suspensions, diffusion of moisture, and structure of foods. Former course Agricultural Engineering 289E. Offered in alternate years.

240. Infiltration and Drainage (3) II. Grismer

Lecture—3 hours. Prerequisite: Soil Science 107; Water Science 140. Aspects of multiphase flow in soils and their application to infiltration and drainage. Gas phase transport and entrapment during infiltration, and transient drainage with nonlinearity, capillarity, and evapotranspiration considered. Offered in alternate years.

241. Sprinkle and Trickle Irrigation Systems (3) III. Hills

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 145. Computerized design of sprinkle and trickle irrigation systems. Consideration of emitter mechanics, distribution functions and water yield functions.

242. Hydraulics of Surface Irrigation (3) III. Wallender

Lecture—3 hours. Prerequisite: a course in differential and integral calculus; a course in hydraulics or fluid mechanics including some open-channel flow; a course in irrigation principles. Mathematical models of surface-irrigation systems for prediction of the ultimate disposition of water flowing onto a field. Quantity of runoff and distribution of infiltrated water over field length as a function of slope, roughness, infiltration and inflow rates.

***245. Management of Wastes from Biological Production Systems (3) II.** Piedrahita

Lecture—3 hours. Characterization of wastes from livestock, crop residues and food processing. Study of methods of collection, treatment, and disposal of these wastes. Offered in alternate years.

260. Analog Instrumentation (4) II. Delwiche

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 100. Instrument characteristics: generalized instrument models, calibration, and frequency response. Signal conditioning: operational amplifier circuits, filtering, and noise. Transducers: motion, force, pressure, flow, temperature, and photoelectric. Offered in alternate years.

265. Design and Analysis of Engineering Experiments (4) III. Upadhyaya

Lecture—3 hours; laboratory—3 hours. Prerequisite: at least one undergraduate course in statistics or consent of instructor. Design, management, and analysis of engineering experiments with emphasis on criteria for the selection and utilization of statistical methods. Problems necessitating the use of campus and departmental computing facilities will be assigned.

270. Modeling and Analysis of Biological and Physical Systems (3) III. Upadhyaya, T. Rumsey

Lecture—3 hours. Prerequisite: Civil Engineering 212A. Mathematical modeling of biological systems: model development; analytical and numerical solutions. Case studies from various specializations within Agricultural Engineering. Offered in alternate years.

275. Physical Properties of Biological Materials (3) I. Chen

Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Selected topics on physical properties, such as mechanical, optical, rheological, and aerodynamic properties, as related to the design of harvesting, handling, sorting, and processing equipment. Techniques for measuring and recording physical properties of biological materials.

289A-K. Selected Topics in Biological Systems Engineering (1-5) I. The Staff

Variable 1-5. Prerequisite: Consent of instructor. Special topics in: (A) Animal Systems Engineering; (B) Aquacultural Engineering; (C) Biological Engineering; (D) Energy Systems; (E) Environmental Quality; (F) Food Engineering; (G) Forest Engineering; (H) Irrigation and Drainage; (I) Plant Production and Harvest; (J) Postharvest Engineering; (K) Sensors and Actuators. May be repeated for credit when topic differs.

290. Seminar (1) I, II, III. The Staff

Seminar—1 hour. Prerequisite: graduate standing. Weekly seminars on recent advances and selected topic in biological systems engineering. Course theme will change from quarter to quarter. May be repeated for credit. (S/U grading only.)

290C. Graduate Research Conference (1) I, II, III. The Staff (Hills in charge)

Discussion—1 hour. Prerequisite: consent of instructor. Research problems, progress and techniques in biological systems engineering. May be repeated for credit. (S/U grading only.)

297. Advances in Food Engineering (1) I, II, III. Singh

Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of current literature and developments in food engineering. Presentations by individual students. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Hills in charge)

299. Research (1-12) I, II, III. The Staff (Hills in charge)
(S/U grading only.)

Professional Course

390. Supervised Teaching in Biological and Agricultural Engineering (1-3) I, II, III. Singh

Laboratory—3 hours; tutorial—3-9 hours. Prerequisite: graduate standing; consent of instructor. Tutoring and teaching students in undergraduate courses offered in the Department of Biological and Agricultural Engineering. Weekly conferences with instructor, evaluation of teaching. Preparing for and conducting demonstrations, laboratories and discussions. Preparing and grading exams. May be repeated for a total of 6 units. (Former course 297T.) (S/U grading only.)

Engineering: Chemical Engineering and Materials Science

(College of Engineering)

Brian G. Higgins, Ph.D., Chairperson of the Department

Subhash H. Risbud, Ph.D., Vice-Chairperson of the Department (916-752-0474)

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Faculty

Nicholas L. Abbott, Ph.D., Assistant Professor
Roger B. Boulton, Ph.D., Professor (*Chemical Engineering, Viticulture and Enology*)

Stephanie R. Dungan, Ph.D., Assistant Professor (*Chemical Engineering, Food Science and Technology*)

Bruce C. Gates, Ph.D., Professor
Brian G. Higgins, Ph.D., Professor
Alan P. Jackman, Ph.D., Professor
Benjamin J. McCoy, Ph.D., Professor
Karen A. McDonald, Ph.D., Associate Professor
Ahmet N. Palazoglu, Ph.D., Associate Professor
Ronald J. Phillips, Ph.D., Assistant Professor
Robert L. Powell, Ph.D., Professor
Dewey D.Y. Ryu, Ph.D., Professor
Pieter Stroeve, Sc.D., Professor
Stephen Whitaker, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*

Emeriti Faculty

Richard L. Bell, Ph.D., Professor Emeritus
J. M. Smith, Sc.D., Professor Emeritus

Division of Materials Science and Engineering

Faculty

Jeffery C. Gibelg, Ph.D., Associate Professor
Joanna R. Groza, Ph.D., Associate Professor
David G. Howitt, Ph.D., Professor
Amiya K. Mukherjee, D.Phil., Professor, *Academic Senate Distinguished Teaching Award, UC Davis Prize for Teaching and Scholarly Achievement*

Zuhair A. Munir, Ph.D., Professor
Howard L. Needles, Ph.D., Professor (*Textiles and Clothing*)

Subhash H. Risbud, Ph.D., Professor
James F. Shackelford, Ph.D., Professor
S. Haig Zeronian, Ph.D., D.Sc., Professor (*Textiles and Clothing*)

Courses in Engineering: Chemical (ECH)

(Courses in Chemical Engineering (ECH) are listed below; courses in Materials Science and Engineering (EMS) are listed immediately following.)

Lower Division Courses

1. The Scope of Chemical Engineering (1) II. The Staff (Chairperson in charge)
Lecture—1 hour. Demonstrations and discussions of the opportunities in chemical engineering for professional development, contributions to basic knowledge, with clarification of what chemical engineers actually do in various jobs. (P/NP grading only.)

90X. Lower Division Seminar (1) I, II, III. The Staff Seminar—1 hour. Examination of a special topic in a small setting.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor and lower division standing. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

150A. Chemical Engineering Fluid Mechanics (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 22A, 22B, 21D, Engineering 35. Fluid statics and one-dimensional laminar flows. Kinematics of point and integral functions. The stress vector-stress tensor relation. Newton's law of viscosity and application of the Navier-Stokes equations to laminar flow and dimensional analysis. Flow of non-Newtonian fluids. Not open for credit to students who have completed Engineering 103A.

150B. Chemical Engineering Fluid Mechanics (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 150A. Turbulent flows and time averaging. Application of Bernoulli's equation and the macroscopic mass, momentum, and mechanical energy balances to a variety of practical problems. Introduction to compressible flow. The entropy equation and isentropic processes. Shock waves and choke flow. Not open for credit to students who have completed Engineering 103B or Civil Engineering 141.

150C. Rheology and Polymer Processing (4) III. Powell
Lecture—4 hours. Prerequisite: Course 150A. Fundamentals of rheology. Introduction to polymer processing unit operations.

151. Material Balances (3) I. Whitaker
Lecture—3 hours. Prerequisite: Chemistry 110A, Chemistry 128B (may be taken concurrently), Engineering 5. Application of the principles of conservation of mass to single and multi-component systems in chemical process calculations. Studies of batch, semi-batch, and continuous processes involving mass transfer, change of phase, and chemical reaction.

152A. Chemical Engineering Thermodynamics (3) II. The Staff
Lecture—3 hours. Prerequisite: course 151, Chemistry 110A. Application of principles of thermodynamics to chemical processes. Not open for credit to students who have completed Engineering 105A.

152B. Chemical Engineering Thermodynamics (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 152A. Continuation of course 152A. Not open for credit to students who have completed Engineering 105B.

153. Chemical Engineering Heat Transfer (4) II, III. The Staff
Lecture—4 hours. Prerequisite: course 150A. Steady and transient heat conduction. The thermal energy equation, analysis of forced and free convective heat transfer. Turbulence, macroscopic balances, and heat transfer coefficients. The photon transport equation and radiant energy exchange. The design of heat exchangers.

154A. Mass Transfer (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 153, Chemistry 110A. Fundamental concepts of mass transfer in fluids. Problems in pure diffusion and convective mass transfer.

154B. Applications of Mass Transfer (3) II. The Staff
Lecture—3 hours. Prerequisite: course 154A. Application of the principles of mass transfer and thermodynamic equilibrium to absorption, extraction, distillation, and other separation processes.

155A. Chemical Engineering Laboratory (4) I, II. The Staff
Laboratory—12 hours. Prerequisite: course 154A. Laboratory experiments in heat, mass, and momentum transfer and in chemical kinetics.

155B. Chemical Engineering Laboratory (4) II, III. The Staff
Laboratory—12 hours. Prerequisite: courses 154B, 155A. Continuation of 155A.

156A. Chemical Engineering Kinetics (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 152B, 154A; and Chemistry 110C (may be taken concurrently). Chemical kinetics and introduction to homogeneous and heterogeneous reactor design.

156B. Chemical Engineering Kinetics (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 156A. Continuation of course 156A.

157. Process Dynamics and Control (3) I. McDonald
Lecture—3 hours. Prerequisite: course 159. Fundamentals of dynamic modelling of chemical processes. Design and analysis of classical feedback control of chemical processes.

157L. Process Control Laboratory (1) II, III. The Staff
Laboratory—3 hours; discussion—1 hour. Prerequisites: course 157. Laboratory experiments in control system design and analysis.

158A. Economics and Optimization of Chemical Processes (3) I. Palazoglu
Lecture—3 hours. Prerequisite: senior standing. Fundamentals of economics, interest calculations, depreciation, taxes. Economic analysis of chemical plant designs. Optimization methods. Linear and non linear programming.

158B. Process Equipment Design (3) II. Palazoglu
Lecture—3 hours. Prerequisite: course 158A. Design of chemical process equipment. Equipment cost estimation techniques.

158C. Chemical Plant Design (3) III. Palazoglu
Lecture—3 hours. Prerequisite: course 158B. Conceptual design of chemical processes. Design, costing and profitability analysis of complete chemical plants. Use of computer-aided design techniques.

159. Chemical Engineering Analysis (3) I. The Staff
Lecture—3 hours. Prerequisite: Mathematics 22B. Chemical engineering applications of partial differential equations, tensors, systems of linear equations, and operational calculus.

161A. Biochemical Engineering Fundamentals (3) II. McDonald
Lecture—3 hours. Prerequisite: Chemistry 128A, Mathematics 22B, Microbiology 102 (or consent of instructor). Biokinetics; bioreactor design and operation; transport phenomena in bioreactors; microbial, plant, and animal cell cultures. (Not open for credit to students who have completed course 161.)

161B. Bioseparations (3) II. The Staff
Lecture—3 hours. Prerequisite: course 154A. Product recovery and purification of biochemicals. Cell disruption, centrifugation, filtration, membrane separations, extraction, and chromatographic separation processes.

161L. Bioprocess Engineering Laboratory (4) III. McDonald
Laboratory—9 hours; discussion—1 hour. Prerequisite: courses 161A, 161B. Laboratory experiments in

the operation and analysis of bioreactors; determination of oxygen mass transfer coefficients in bioreactors; ion exchange chromatography; membrane filtration.

***163. Chemical Engineering in Integrated Circuit Fabrication Technology** (4) I. The Staff
Lecture—4 hours. Prerequisite: course 154A (concurrently); Chemistry 128B. Manufacture of semiconductor devices, integrated circuits, magnetic bubble memories, tapes and disks involving application of chemical engineering processing techniques. The chemistry and engineering of the industrial fabrication of modern circuits and devices.

166. Catalysis (3) II. Gates
Lecture—3 hours. Prerequisite: course 156A (may be taken concurrently) or consent of instructor. Principles of catalysis based on an integration of principles of physical, organic, and inorganic chemistry and chemical kinetics and chemical reaction engineering. Catalysis in solution; catalysis by enzymes; catalysis in swellable polymers; catalysis in microscopic cages (zeolites); catalysis on surfaces.

170. Introduction to Colloid and Surface Phenomena (3) III. Stroeve

Lecture—3 hours. Prerequisite: Chemistry 110A. Introduction to the behavior of surfaces and disperse systems. The fundamentals will be applied to the solution of practical problems in colloid science. The course should be of value to engineers, chemists, biologists, soil scientists, and related disciplines.

190C. Research Group Conferences (1) I, II, III.

The Staff
Discussion—1 hour. Prerequisite: upper division standing in Chemical Engineering; consent of instructor. Research group conferences. May be repeated for credit. (P/NP grading only.)

190X. Upper Division Seminar (1) I, II, III. The Staff Seminar—1 hour. Prerequisite: Upper division standing. In-depth examination of a special topic in a small group setting.

198. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

206. Biochemical Engineering (3) II. Ryu
Lecture—3 hours. Prerequisite: Microbiology 102 and 102L, Biological Sciences 101, 102, 103, Molecular and Cellular Biology 120L, 200A; Food Science and Technology 205 recommended; or consent of instructor. Interaction of chemical engineering, biochemistry, and microbiology. Mathematical representations of microbial systems. Kinetics of growth, death, and metabolism. Continuous fermentation, agitation, mass transfer and scale-up in fermentation systems, product recovery, enzyme technology. Offered in alternate years.

226. Enzyme Engineering (3) II. Ryu
Lecture—3 hours. Prerequisite: Microbiology 102 and 102L, Biological Sciences 102, 103, Molecular and Cellular Biology 122, 120L, 200A; or consent of instructor. Application of basic biochemical and engineering principles of practical enzymatic processes. Lectures cover large scale production and separation of enzymes, immobilized enzyme systems, enzyme reactor design and optimization, and new application of enzymes in genetic engineering related biotechnology. Offered in alternate years.

246. Advanced Biochemical Engineering (2) III.

Ryu
Lecture—2 hours. Prerequisite: course 206 or consent of instructor. Advances in the field of biotechnology including genetic engineering, enzyme engineering, fermentation science, and renewable resources development. The important results of original research will be evaluated for understanding of the fundamental principles and for potential practical application.

252. Statistical Thermodynamics (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 152B, Engineering 105B, or the equivalent. A treatment of the statistical basis of thermodynamics; introduction to statistical mechanics; discussion of the laws of thermodynamics; application of the thermodynamic relationships to phase and chemical reaction equilibrium; introduction to molecular simulations and the evaluation of thermodynamic properties from molecular simulations.

253A. Advanced Fluid Mechanics (4) I. The Staff
Lecture—4 hours. Prerequisite: courses 150A, 150B and 259. Kinematics and basic principles of fluid flow. Principles of constitutive equations. Navier-Stokes equations for Newtonian fluids. Survey or rectilinear creeping flow, lubrication flow, and boundary layer theory.

253B. Advanced Heat Transport (4) II. The Staff
Lecture—4 hours. Prerequisite: courses 153 and 259 or the equivalent. Fundamental energy postulates and derivation of microscopic and macroscopic energy equations. Mechanisms of conduction. Isotropic, thermoelastic and anisotropic materials solution problems using Green's functions and perturbation theory. Photon transport, black and gray body radiation, radiative exchange. Free and forced convection.

253C. Advanced Mass Transfer (4) II. The Staff
Lecture—4 hours. Prerequisite: courses 154A, 154B, and 259 (may be taken concurrently) or the equivalents. Kinematics and basic conservation principles for multicomponent systems. Constitutive equations for momentum, heat and mass transfer. Applications to binary and ternary systems. Details of diffusion with reaction, and the effects of concentration.

***254. Colloid and Surface Phenomena (4) III.** Stroeve

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in science or engineering or consent of instructor. Thermodynamics, structure and rate processes at interfaces. These fundamental processes will then be applied to determine the collective properties of disperse colloidal systems. Some emphasis on the behavior of macromolecules in solution.

256. Chemical Kinetics and Reaction Engineering (4) III. Gates

Lecture—4 hours. Prerequisite: courses 156A and 156B or the equivalent. Analysis of the performance of chemical reactors and design of chemical reactors based on the principles of chemical kinetics and transport phenomena. Consideration of noncatalytic and catalytic reactions in single fluid phases and emphasis on reactions in multiphase mixtures, especially gas-solid reactors.

259. Advanced Engineering Mathematics (4) I. The Staff
Lecture—4 hours. Prerequisite: Mathematics 22A, 22B, 21D. Applications of methods of applied mathematics to the analytical and numerical solution of linear and non-linear ordinary and partial differential equations arising in the study of transport phenomena.

260. Separation Processes: Particulate Systems (3) I. The Staff

Lecture—3 hours. Prerequisite: course 154A. Analysis of particle systems in pollution abatement and chemical process equipment. Microorganisms, crystallization, aerosols, hydrosols, colloids. Distribution functions, population balances, rarefied gas phenomena, concentration polarization in reverse osmosis and filtration. Offered in alternate years.

261. Separation Processes: Column Operations (3) III. McCoy

Lecture—3 hours. Prerequisite: course 154B. Analysis and design of chemical separation processes: distillation, extraction, adsorption, chromatography. Finite difference equations, unified design methods, axial dispersion models, probability and random walk theories, method of characteristics, moment analysis, optimization. Offered in alternate years.

262. Transport Phenomena in Multiphase Systems (3) III. Whitaker

Lecture—3 hours. Prerequisite: course 253C. Heat,

mass, and momentum transfer in multiphase, multi-component systems with special emphasis on transport processes in porous media. Derivation of the averaging theorem and application of the method of volume averaging to multicomponent, reacting systems.

263. Rheology and Mechanics of Non-Newtonian Fluids (3) II. Powell

Lecture—3 hours. Prerequisite: courses 253A and 259 or consent of instructor. Mechanics of polymer solutions and suspension, especially the development of properly invariant constitutive equations. Topics include: viscometry, linear and nonlinear viscoelasticity, continuum mechanics, kinetic theory. Offered in alternate years.

264. Introduction to Hydrodynamic Stability Theory (4) III. Higgins

Lecture—4 hours. Prerequisite: course 253A. Mathematical structure for studying the stability of fluid motions. Introduction to bifurcation theory and the spectral problem for linear stability. Offered in alternate years.

265. Emulsions, Microemulsions and Bilayers (3) I. Dungan

Lecture—3 hours. Prerequisite: an undergraduate course in physical chemistry. Thermodynamic and mechanical descriptions of surfactant-laden interfaces. Forces between and within interfaces. Physics of micelle and microemulsion formation. Structure and stability of emulsions. Properties of phospholipid bilayers, with emphasis on vesicles.

267. Advanced Process Control (3) III. McDonald, Palazoglu

Lecture—3 hours. Prerequisite: course 157 or the equivalent. Advanced course in analysis and synthesis of linear multivariable systems. Emphasis on frequency domain techniques and applications to chemical processes. Topics include singular value analysis, internal model control, robust controller design methods as well as self-tuning control techniques. Offered in alternate years.

289A-L. Special Topics in Chemical Engineering (1-5) I, II, III. The Staff

Lecture and/or laboratory. Prerequisite: consent of instructor. Special topics in (A) Fluid Mechanics; (B) Nonlinear Analysis and Numerical Methods; (C) Process Control; (D) Chemistry of Catalytic Processes; (E) Biotechnology; (F) Interfacial Engineering; (G) Molecular Thermodynamics; (H) Membrane Separations; (I) Advanced Materials Processing; (J) Novel Experimental Methods; (K) Advanced Transport Phenomena; (L) Biomolecular Engineering.

290. Seminar (1) I, II, III. The Staff
Seminar—1 hour. (S/U grading only.)

290C. Graduate Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: consent of instructor. Research problems, progress and techniques in chemical engineering. May be repeated for credit. (S/U grading only.)

291. Seminar in Multiphase Transport Phenomena (1) I, II, III. The Staff

Seminar—1 hour. Prerequisite: graduate or senior standing. Seminar devoted to the theoretical and practical applications of multiphase transport phenomena. Subjects will include flow in porous media, dispersion with adsorption and reaction, and heat transfer in multiphase systems with chemical reaction. (S/U grading only.)

292. Seminars in Process Dynamics and Control (1) II. Palazoglu

Seminar—1 hour. Prerequisite: graduate or senior standing. Theoretical and practical aspects of process control will be addressed. Topics will cover controller analysis and synthesis of linear and nonlinear systems including bioreactors, distillation columns and others as well as dynamic modeling of such processes. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

390. Teaching of Chemical Engineering (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: qualifications and acceptance as teaching assistant and/or associate-in in chemical engineering. Participation as a teaching assistant or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated twice for credit. (S/U grading only.)

Courses in Materials Science and Engineering (EMS)

Upper Division Courses

130. Thermodynamics of Materials Processes (3) I. Risbud

Lecture—3 hours. Prerequisite: Engineering 45 and 105A (or the equivalent); upper division standing in Engineering. Application of the principles of thermodynamics to solid engineering materials with emphasis on solving problems associated with materials processes, e.g., alloying, phase stability, surface properties, semiconduction, thermoelectric power and thermionic energy conversion.

132. Structure of Engineering Materials (3) I. Howitt

Lecture—3 hours. Prerequisite: Engineering 45; upper division standing. Structure of engineering materials on the atomic scale will be described by exploring the fundamentals of crystallography. The importance of this structure to materials' properties will be emphasized. Experimental determination of structure will be described using x-ray diffraction techniques.

132L. Structure of Materials Laboratory (1) I. Howitt

Laboratory—3 hours. Prerequisite: course 132 concurrently. Experimental investigations of the structure of solid materials. Laboratory exercises emphasize methods used to study structure of solids at atomic and microstructural levels.

134. Rate Processes in Materials Science (3) III. Groza

Lecture—3 hours. Prerequisite: Engineering 45 and 105A or course 130. Basic kinetic laws. Theory of Absolute Reaction Rates. Applications in diffusion, nucleation, solidification, evaporation, and sintering processes.

134L. Rate Processes in Materials Laboratory (1) III. Groza

Laboratory—3 hours. Prerequisite: course 134 concurrently. Laboratory experiments to illustrate fundamental principles of diffusion, solidification, recrystallization, precipitation, evaporation, sintering and phase transformations in materials.

138. Mechanical Behavior of Materials (3) II. Mukherjee

Lecture—3 hours. Prerequisite: Engineering 45 and 105A (or the equivalent); upper division standing in Engineering. Microscopic aspects of the mechanical behavior of engineering materials are discussed with emphasis on recent developments in materials science and fracture mechanics. High temperature plastic deformation processes, strengthening mechanisms and mechanical failure modes of materials systems are outlined.

138L. Mechanical Properties Laboratory (1) III. Mukherjee

Laboratory—3 hours. Prerequisite: course 138 concurrently. Experimental investigations of mechanical behavior of materials. Laboratory exercises emphasize fundamental relationships between microstructure and mechanical properties.

140. Materials in Engineering Design (3) III. Gibeling
Lecture—3 hours. Prerequisite: senior standing in Engineering or consent of instructor. Quantitative treatment of materials selection for engineering applications. Discussion of the relationship of design para-

meters and materials properties. Emphasis on the processing and fabrication of metals, ceramics, polymers, and composites as related to the overall design process.

140L. Materials Selection Laboratory (1) III.

Gibeling

Laboratory—3 hours. Prerequisite: course 140 concurrently. Experimental investigations of processing and properties of materials used in structural applications. Laboratory exercises emphasize fundamental relationships between microstructure and properties. Consideration given to the role of property control in materials selection.

142. Principles of Nondestructive Testing (3) II.

Shackelford

Lecture—3 hours. Prerequisite: senior standing in Engineering or consent of instructor. Basic principles of nondestructive testing using radiological, ultrasonic, electrical, magnetic, penetrant methods, etc., are discussed. Typical results expected from these tests and their application in material characterization, flaw detection, crystallographic information, chemical inhomogeneity, residual stress analysis, etc., are emphasized.

142L. Nondestructive Testing Laboratory (1) II.

Shackelford

Laboratory—3 hours. Prerequisite: course 142 concurrently. Laboratory experience in non-destructive testing techniques with emphasis on X-ray radiography, X-ray diffraction, and ultrasonics.

144. Corrosion and Oxidation of Engineering Materials (3) I. The Staff

Lecture—3 hours. Prerequisite: upper division standing in Engineering. Principles governing the interaction between engineering materials and their environment; corrosion in aqueous media, soils and biological systems. Oxidation of structural materials in high temperature applications; design and selection criteria for the prevention and control of corrosion.

144L. Corrosion Laboratory (1) I. The Staff

Laboratory—3 hours. Prerequisite: course 144 concurrently. Laboratory experiments to demonstrate corrosion behavior of materials in aqueous and high temperature environments. Relationship between corrosion behavior and fundamental principles and theories emphasized.

146. Electronic and Optical Materials Processing (3) III. Risbud

Lecture—3 hours. Prerequisite: upper division standing in Engineering, Physics, Chemistry, or Geology. Principles of phase equilibria, thermodynamics and reaction kinetics applied to the processing of electronic and optical materials in polycrystalline, single crystal, and amorphous forms.

147. Principles of Polymer Materials Science (3) II. The Staff

Lecture—3 hours. Prerequisite: chemistry through organic or Engineering 45; introductory physics sequence. Basic principles of polymer science presented including polymer structure and synthesis; polymerization mechanisms, polymer classes, properties, and reactions; polymer morphology, rheology, and characterization; polymer processing. (Same course as Fiber and Polymer Science 100.)

148. Failure Analysis (4) III. The Staff

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 45, 104A; course 138 and Mechanical Engineering 150A recommended. Fracture mechanics and failure mechanisms in metals, ceramics, and composites. Effects of fatigue, corrosion and wear. Methodology for investigating failure including optical microscopy, scanning electron microscopy and destructive testing.

149. Materials Engineering Design Project (3) I, II, III. The Staff

Discussion—1 hour; laboratory—6 hours. Prerequisite: course 140 may be taken concurrently. A capstone engineering design experience involving analysis of real materials processes or engineering materials problems. The various principles of materials science introduced in other courses in the curriculum are integrated into the design project.

155. Manufacturing Process Design (3) II. Groza

Lecture—2 hours; discussion—1 hour. Prerequisite: Engineering 45, Mechanical Engineering 150A (may be taken concurrently). Principles of materials processing and manufacturing properties, effects of processing variables on structure-property relationships, and the fundamentals of manufacturing process selection are described. Case histories are used to explore recent developments in manufacturing process design.

190C. Research Group Conferences (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: consent of instructor; upper division standing. Individual and/or group conference on problems, progress and techniques in materials research. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff

Lecture—1-5 hours. Prerequisite: consent of instructor. Group study of selected topics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. P/NP grading only.

Graduate Courses

***230. Fundamentals of Electron Microscopy (3) II. Howitt**

Lecture—2 hours; discussion—1 hour. Prerequisite: Engineering 132. Principles and techniques of scanning and transmission of electron microscopy used in the study of materials. Emphasis upon practical applications. Offered in alternate years.

***230L. Laboratory for Electron Microscopy (2) II. Howitt**

Laboratory—6 hours. Prerequisite: course 230 concurrently. Practical application of techniques of electron scanning and transmission microscopy including x-ray microanalysis. Offered in alternate years.

232. Advanced Topics in Transmission Electron Microscopy (3) II. Howitt

Lecture—1 hour; discussion—2 hours. Prerequisite: course 230. Advanced course in the techniques of electron microscopy including analytical techniques, probe diffraction methods, and high resolution imaging. Offered in alternate years.

232L. Laboratory for Advanced Transmission Electron Microscopy (2) II. Howitt

Discussion—1 hour; laboratory—3 hours. Prerequisite: course 232 concurrently. Laboratory in advanced transmission electron microscopy techniques relevant to specific graduate research projects in materials science. Offered in alternate years.

240. Transport Phenomena in Materials Processes (4) II. Risbud

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Engineering. Phenomenological and atomistic mechanisms in transport processes in condensed and noncondensed phases. Application to heat treatment, chemical and physical vapor deposition, crystal growth, bonding, sintering and joining of metals. Offered in alternate years.

***241. Principles and Applications of Dislocation Mechanics (4) II. Mukherjee**

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Engineering; consent of instructor. Concepts in dislocation theory are applied to explain plasticity of crystalline solids. Glide and climb of dislocations, strain hardening, recrystallization, theories of creep processes and interaction of dislocation with solute atoms, precipitates and impurity clouds are discussed. Offered in alternate years.

242. Advanced Mechanical Properties of Materials (4) II. Mukherjee

Lecture—3 hours; discussion—1 hour. Prerequisite: course 138. Strength and structure of engineering materials. The dependence of their mechanical properties on time, stress, and temperature. Generalized concepts of dislocation theory in plastic deformation, including creep, superplasticity, and cavitation. Influence of microstructure in optimizing the mechanical strength properties. Offered in alternate years.

***243. Kinetics of Phase Transformation in Engineering Materials (3) II. Groza**

Lecture—3 hours. Prerequisite: graduate standing in Engineering and consent of instructor; course 130 recommended. Theory of alloying, kinetics of phase changes, homogeneous and heterogeneous transformation, transformation by shear, order-disorder reactions. Offered in alternate years.

244. Interaction of Materials and their Environment (3) I. Munir

Lecture—3 hours. Prerequisite: Engineering 45 and 105A, or consent of instructor. Thermodynamic and kinetic foundations of the corrosion and oxidation processes. Practical aspects of corrosion control and prevention. Stress-corrosion and gas-embrittlement phenomena. Special topics in corrosion; microbiological and atmospheric corrosion. Offered in alternate years.

245. Advanced Topics in Structure of Materials (4) III. Shackelford

Lecture—3 hours; discussion—1 hour. Prerequisite: course 132 and graduate standing in Engineering or consent of instructor; courses 138 and 142 recommended. Nature of microstructure in engineering materials will be explored. Crystalline and non-crystalline structures will be studied with special emphasis on grain boundary segregation in development of polycrystalline microstructure and the radial distribution function of amorphous materials. Offered in alternate years.

***246. Current Topics in Electronic Materials Processing (3) III. Risbud**

Lecture—3 hours. Prerequisite: course 146; graduate standing in physical sciences or engineering. Discussion of current literature and topical areas related to the processing of electronic and optical materials in polycrystalline, single crystal, and amorphous forms. Offered in alternate years.

***247. Advanced Thermodynamics of Solids (3) I. Munir**

Lecture—3 hours. Prerequisite: course 130 or the equivalent. Thermodynamics of gas-solid reactions and solutions; criteria for phase stability, thermodynamics of surfaces and interfaces; thermodynamics of defects in compounds, their influence on transport processes; thermodynamics of EMF cells and application to solid-state electrolytes. Offered in alternate years.

***248. Fracture of Engineering Materials (3) I. Gibeling**

Lecture—3 hours. Prerequisite: course 138. Description of failure of materials by crack propagation. Topics include the stress fields about elastic cracks, the Griffith-Irwin analysis, descriptions of plastic zones, fracture toughness testing, microstructural aspects of fracture and failure at elevated temperatures. Offered in alternate years.

249. Mechanisms of Fatigue (3) I. Gibeling

Lecture—3 hours. Prerequisite: course 138 or consent of instructor; course 248 recommended. Microstructural description of mechanisms of fatigue in metals. Topics include a phenomenological treatment of cyclic deformation, dislocation processes in cyclic deformation, fatigue crack nucleation, stage I crack growth, threshold effects and high temperature cyclic deformation. Offered in alternate years.

250A-F. Special Topics in Polymer and Fiber Science (3) II. Zeronian

Lecture—3 hours. Prerequisite: course 147 or consent of instructor. Selected topics of current interest in polymer and fiber sciences. Topics will vary each time the course is offered. (Same course as Textiles and Clothing 250A-F.)

290C. Graduate Research Conference (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: consent of instructor. Individual and/or group conference on problems, progress, and techniques in materials science and engineering research. May be repeated for credit. (S/U grading only.)

294. Materials Science Seminar (1) I, II, III. Shackelford, Mukherjee, Munir, Howitt, Gibeling, Groza, Risbud

Seminar—1 hour. Prerequisite: graduate student in good standing. Review and discussion of current literature and developments in materials science with presentations by individual students. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Professional Course

390. The Teaching of Materials Science (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in mechanical engineering. Participation as a teaching assistant or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated twice for credit. (S/U grading only.)

Engineering: Civil and Environmental

(College of Engineering)

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Daniel P. Y. Chang, Ph.D., Professor
Yannis F. Dafalias, Ph.D., Professor
Jeannie L. Darby, Ph.D., Assistant Professor
Johannes J. DeVries, Ph.D., Lecturer
Leonard R. Herrmann, Ph.D., Professor, *Academic Senate Distinguished Teaching Award, UC Davis Prize for Teaching and Scholarly Achievement*

I.M. Idriss, Ph.D., Professor
Roy A. Imbsen, D.E., Adjunct Professor
Paul P. Jovanis, Ph.D., Professor
M. Levent Kavvas, Ph.D., Professor
Ian P. King, Ph.D., Professor
Bruce L. Kutter, Ph.D., Associate Professor
Bruce E. Larock, Ph.D., Professor
Jay R. Lund, Ph.D., Associate Professor
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Patricia L. Mokhtarian, Ph.D., Assistant Professor
Otto G. Raabe, Ph.D., Professor in Residence (*Civil and Environmental Engineering; Laboratory for Energy-Related Health Research*)

Melvin R. Ramey, Ph.D., Professor
Mark M. Rashid, Ph.D., Assistant Professor
Karl M. Romstad, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*
Edward D. Schroeder, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*
S. Geoffrey Schladow, Ph.D., Assistant Professor
Robert Smith, Ph.D., Lecturer
Daniel Sperling, Ph.D., Professor (*Civil and Environmental Engineering; Environmental Studies*)
Fred Stephenson, M.S., Lecturer
George Tchobanoglous, Ph.D., Professor

Emeriti Faculty

Don O. Brush, Ph.D., Professor Emeritus
Robert H. Burgy, M.S., Professor Emeritus
James A. Cheney, Ph.D., Professor Emeritus
James R. Hutchinson, Ph.D., Professor Emeritus
Ray B. Krone, Ph.D., Professor Emeritus

Gerald T. Orlob, Ph.D., Professor Emeritus
Verne H. Scott, Ph.D., Professor Emeritus
Chih-Kang Shen, Ph.D., Professor Emeritus
Michael A. Taylor, Ph.D., Professor Emeritus

Courses in Engineering: Civil and Environmental (ECI)

Lower Division Courses

1. The Civil Engineer in Society (1) I. The Staff (Chairperson in charge)

Lecture—1 hour. A description of the field of civil engineering and the function of the professional civil engineer. Discussion of professional practice with respect to application of engineering principles, ethics, and responsibilities. (P/NP grading only.)

10. Introduction to Surveying (3) III. The Staff (Chairperson in charge)

Lecture—2 hours; laboratory—3 hours. Theory and practice of measurements for distance, elevations, and angles; the analyses and adjustments for systematic and random measurement errors; line directions, traverse computations, horizontal and vertical curves; astronomical observations and calculations for latitude, longitude, azimuth, and time.

30. Engineering a Better Environment (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: intermediate algebra, and Physics 10 or Engineering 20. Introduction to fundamental concepts and methodologies of environmental engineering. Topics presented include water and air quality, environmental radiation and radioactivity, waste management. Students will evaluate environmental issues in written essays and oral discussion. Intended for non-physical science majors. General Education credit: Nature and Environment.

92. Internship in Engineering (1-5) I, II, III. The Staff (Chairperson in charge)

Internship. Prerequisite: lower division standing; approval of project prior to period of internship. Supervised work experience in civil engineering. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor and lower division standing. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

114. Probabilistic Systems Analysis for Civil Engineers (3) I, II. Mokhtarian

Lecture—3 hours. Prerequisite: Mathematics 21C. Probabilistic concepts and models in civil engineering. Statistical analysis of civil engineering experimental and field data. Introduction to stochastic processes models of civil engineering systems.

131A. Structural Analysis (3) I, III. Romstad

Lecture—3 hours. Prerequisite: Mathematics 22A; Engineering 104B (may be taken concurrently). Open to Engineering students only. Elastic structural analysis of determinate and indeterminate trusses, beams, and frames. Calculation of displacements. Methods of virtual work, moment area, superposition, slope deflection, moment distribution.

131B. Matrix Structural Analysis and Introduction to Finite Element (3) I. Romstad

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 104B. Open to Engineering students only. Matrix formulation and computer analysis of statically indeterminate structures. Introduction to finite element methods for elasticity and bending problems.

132A. Structural Design: Metallic Elements (3) I, II. Ramey

Lecture—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). Metallic beams, columns, and other members; analysis and design of bolted and welded joints; design of simple beam connections, moment resistant connections, and column base plates.

132B. Structural Design: Concrete Elements (3) I, III. Chai

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). Open to Engineering students only. Elastic and ultimate strength design procedures for columns and rectangular beams, T-beams and beams of general cross-section. Building code requirements for bending, shear, axial load, combined stresses and bond.

132C. Structural Design: Timber Elements (3) III. Ramey

Lecture—3 hours. Prerequisite: course 132A. Elements of timber structures and laminated structures, including connection design.

133. Properties of Concrete (4) I. The Staff
Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 35; senior standing. Physical and chemical properties of cements, the properties of fresh concrete, the ingredients of concrete, the desirable characteristics of hardened concrete, and how to obtain them. Mix design methods.

134. Analysis and Design of Buildings (3) III. The Staff

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 131A, 132A; 132B (may be taken concurrently). Dead and live loading; earthquake and wind forces. Approximate analyses of building frames; concrete building design. Plastic analysis of metal frames.

137. Construction Principles (3) III. The Staff (Chairperson in charge)

Lecture—2 hours; laboratory—3 hours. Prerequisite: senior standing in Engineering. A study of the construction industry; its form, evolution, and methods of operation; fundamental principles underlying construction practices; economic factors in planning, organizing, and operating a construction force. Field trips and analysis of local construction projects.

138. Earthquake Loads on Structures (3) I. Romstad

Lecture—3 hours. Prerequisite: course 131A, Engineering 36. Determination of loads on structures due to base motions. Methods of static lateral forces, approximate dynamic analysis (response spectrum), and time history. Concepts of mass, damping, and stiffness for typical structures. Design for inelastic behavior. Consideration of wind and blast loading.

139. Prestressed Concrete (3) II. The Staff

Lecture—3 hours. Prerequisite: course 132B. Principles and methods, analysis and design of sections for bending, interactive computer analysis, ultimate strength of sections. Loss of prestress, shear design. Applications to bridges, buildings, and tanks. Special materials properties needed for effective prestressing.

140. Environmental Analysis of Aqueous Systems (3) I. Darby

Lecture—3 hours. Prerequisite: Chemistry 2B or the equivalent. Introduction to chemical principles underlying current practices in sampling and analysis of water and wastewater.

140L. Environmental Analysis of Aqueous Systems Lab (1) I. Darby

Laboratory—3 hours. Prerequisite: Chemistry 2B or the equivalent. Introduction to the "wet chemical" and instrumental techniques commonly used in the examination of water and wastewater and associated data analysis.

141. Engineering Hydraulics (3) I, III. Larock

Lecture—3 hours. Prerequisite: Engineering 103A. Open to Engineering students only. Nature of flow of a real fluid; flow in pipes; open channel flow; turbomachinery; fluid forces on objects: boundary layers, lift and drag.

141L. Engineering Hydraulics Laboratory (1) I, III. Larock

Laboratory—3 hours. Prerequisite: course 141 (may be taken concurrently). Open to Engineering students only. Laboratory experiments and demonstrations on flow measurement, sluice gates, hydraulic jump, flow characteristics, and centrifugal pumps.

142. Engineering Hydrology (3) I, II. Kavvas

Lecture—3 hours. Prerequisite: course 141 (may be taken concurrently) or the equivalent. Open to Engineering students only. Study of the hydrologic cycle. Frequency analysis of hydrologic variables. Precipitation analysis for hydrologic design. Evapo-transpiration, interception, depression storage and infiltration. Streamflow analysis. Flood routing through channels and reservoirs.

142L. Engineering Hydrology Laboratory (1) II. DeVries

Laboratory—3 hours. Prerequisite: course 142 (may be taken concurrently). Laboratory calculations and demonstrations of hydrologic processes, such as rainfall-runoff, storm characteristics and precipitation, evaporation and transpiration, infiltration, streamflow, and flood routing.

144. Groundwater Systems Design (3) I. Darby
Lecture—3 hours. Prerequisite: Engineering 5 and course 142 (may be taken concurrently); Applied Science Engineering 115 recommended. Groundwater occurrence, distribution, and movement; well-flow systems; design of wells; groundwater quality and contamination; aquifer management. Introduction to groundwater modeling.

145. Hydraulic Structure Design (3) III. DeVries
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 141, 141L, 142. Principles of project design. Methods of analysis and hydraulic design of storage systems, diversion structures, conveyance and regulation systems, and structures for irrigation, power, and flood control projects. Emphasis is on application of principles of open channel hydraulics in these systems.

146. Water Resources Simulation (3) II. Lund
Lecture—3 hours. Prerequisite: courses 142 and 114; Applied Science Engineering 115 recommended. Simulation techniques in the design and operation of water resources projects; introduction to simulation theory, testing, and application to surface and groundwater problems and system analysis.

147. Solid Waste Management (3) I. Tchobanoglous

Lecture—2 hours; laboratory—3 hours. Characteristics and amounts of solid wastes; collection systems; introduction to waste treatment processes and return of treated wastes to the environment.

148A. Water Quality Management (3) II, III. Schroeder

Lecture—3 hours. Prerequisite: Engineering 103A. Open to Engineering students only. Introduction to basic concepts of water quality. Fundamentals of water and wastewater treatment processes. Analysis of treatment process flowsheets. Analysis of water quality management alternatives.

148B. Water Quality Management Systems Design (3) III. Tchobanoglous

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 148A (may be taken concurrently). Introduction to the design of water and wastewater treatment processes.

149. Introduction to Air Pollution (3) I. Carroll (Land, Air and Water Resources), Chang, Raabe
Lecture—3 hours. Prerequisite: Mathematics 22B, 21D, Chemistry 2B; Atmospheric Science 121A or Engineering 103A. Examination of physical and technical aspects of air pollution. Emphasis on geophysical processes and air pollution meteorology as well as physical and chemical properties of pollutants. (Same course as Atmospheric Science 149.)

150. Air Pollution Control System Design (3) II. Chang

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 105A and 106; course 149 recommended. Introduction to the design and evaluation of air pollution control devices and systems.

152. Introduction to Civil Engineering Planning (3) I. The Staff

Lecture—3 hours. Prerequisite: course 114 or the equivalent, and Engineering 106 or Economics 1A. Basic planning concepts; role of engineering, economic, environmental, and social information; institutional, political and legal aspects. Case studies will

illustrate planning of water regulation and distribution systems, waste treatment and disposal systems, land and water transportation systems.

153. Deterministic Optimization and Design (3) II. Lund

Lecture—3 hours. Prerequisite: Mathematics 21C, 22A, and Engineering 5 or the equivalent. Introduction to operations research. Optimization techniques such as linear programming, dynamic programming, and non-linear programming. Applications in water resources planning, transportation planning, systems engineering, and other civil engineering disciplines through computer-based design projects.

154. Probabilistic Design and Optimization (3) III. Lund

Lecture—3 hours. Prerequisites: courses 114 and 153, and Engineering 106, or the equivalents. Design by optimization for probabilistic systems, decision theory, the value of information, probabilistic linear programming, probabilistic dynamic programming, nonlinear probabilistic optimization. Applications in civil engineering design, project evaluation, and risk management.

160. Introduction to Transportation Planning (4) I. Sperling

Lecture—3 hours; discussion—1 hour. Prerequisite: any two of course 152, Geography 5, and Economics 1A. Transportation and associated environmental problems confronting urban areas, and prospective technological and institutional solutions. Draws upon concepts and analytical techniques from economics, engineering, political science, and environmental studies. General Education credit: Contemporary Societies.

161. Transportation System Operations (3) II. Jovanis

Lecture—3 hours. Prerequisite: Engineering 36. Principles of transportation system operations; traffic characteristics and methods of measurement; safety and operations; models of transportation operations and congestion applied to urban streets, freeways, and mass transit services.

162. Transportation System Design (3) III. Jovanis
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 160 or 161 or 163. Human vehicle and guideway factors and their relationship to transportation system design. Generalized design paradigm; application to large scale group problem solving.

163. Energy and Environmental Aspects of Transportation (3) II. Sperling

Lecture—3 hours. Prerequisite: course 160 recommended. Application of engineering, economic, and systems planning concepts. Analysis of energy, air quality, and other selected environmental attributes of transportation technologies. Investigation of strategies for reducing pollution and petroleum consumption, in light of institutional and political constraints. (Same course as Environmental Studies 163).

171. Soil Mechanics (4) II, III. Kutter

Lecture—4 hours. Prerequisite: course 104A (may be taken concurrently), course 171L (must be taken concurrently). Restricted to Civil Engineering majors only. Soil formations, mass-volume relationships, soil classification, effective stress, soil-water-void relationships, compaction, seepage, capillarity, compressibility, consolidation, strength, states of stress and failure.

171L. Soil Mechanics Laboratory (1) II, III. Kutter
Laboratory—3 hours. Prerequisite: course 171 must be taken concurrently. Laboratory studies utilizing standard testing methods to determine physical, mechanical and hydraulic properties of soil and demonstration of basic principles of soil behavior.

173. Foundation Design (4) I. Idriss

Lecture—4 hours. Prerequisite: courses 132B, 171, 171L. Soil exploration and determination of soil properties for design; consolidation and elastic settlements of foundations; bearing capacity of soils and footing design; lateral earth pressures and retaining wall design; pile foundations; excavations and de-watering.

174. Environmental Geotechnology (3) III. Arulanandan

Lecture—3 hours. Prerequisite: course 148A and 171. Soil and site characterization in relation to natural and man-made hazards, waste containment, and waste site remediation techniques.

176. Geotechnical Modeling (3) I. Kutter

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 171, 171L. Principles of similarity and the theory of models. Applications to soil mechanics and foundation engineering utilizing centrifugation. Instrumentation, calibration, computer-aided data reduction and recording. Experiments demonstrating basic principles, including bearing capacity, dynamic impact response, and liquefaction in earthquakes.

189A-J. Selected Topics in Civil Engineering (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Directed group study of selected topics with separate sections in (A) Environmental Engineering; (B) Hydraulics and Hydrologic Engineering; (C) Engineering Planning; (D) Geotechnical Engineering; (E) Structural Engineering; (F) Structural Mechanics; (G) Transportation Engineering; (H) Transportation Planning; (I) Water Resources Engineering; (J) Water Resources Planning. May be repeated for credit when the topic is different.

190C. Research Group Conference in Civil and Environmental Engineering (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: upper division standing in Civil and Environmental Engineering; consent of instructor. Research group conferences. May be repeated for credit. (P/NP grading only.)

192. Internship in Engineering (1-5) I, II, III. The Staff (Chairperson in charge)

Internship. Prerequisite: upper division standing; approval of project prior to the period of the internship. Supervised work experience in civil engineering. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: senior standing in engineering and at least a B average. (P/NP grading only.)

Graduate Courses**201. Introduction to Theory of Elasticity (4) I.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 104B. Fundamental equations of elasticity in three dimensions; plane stress and plane strain; flexure and torsion of bars of various shapes. Introduction to variational and approximate methods.

202. Buckling of Columns and Plates (3) II. The Staff

Lecture—3 hours. Prerequisite: courses 201 and 221. Analysis of the buckling behavior of structural members: buckling of columns, lateral buckling of beams, nonlinear bending and lateral-torsional buckling of beam-columns, stability of structural frames, buckling strength and ultimate strength of plates.

203. Inelastic Behavior of Solids (3) III. Dafalias

Lecture—3 hours. Prerequisite: course 201. Fundamentals of theories of plasticity, viscoelasticity and viscoplasticity for solids. Macroscopic constitutive modelling for engineering materials, e.g., metals, polymers, soils, etc., and microscopic motivation. Offered in alternate years.

205. Continuum Mechanics (3) II. Dafalias

Lecture—3 hours. Prerequisite: course 203. Tensor formulation of the field equations for continuum mechanics, including large deformation effects. Introduction to nonlinear thermoelasticity and thermodynamics. Solution of three-dimensional problems. Selected topics. Offered in alternate years.

211. Advanced Matrix Structural Analysis (3) II. Romstad

Lecture—3 hours. Prerequisite: course 131A, 131B, or consent of instructor. Computer analysis of complex frameworks by the displacement method; treatment of

tapered beams, curved beams, and beams on elastic foundations; partially rigid connections; nonlinear and stability analysis; introduction to structural optimization.

212A. Finite Element Procedures in Applied

Mechanics (3) II. Rashid

Lecture—3 hours. Prerequisite: Applied Science Engineering 115 or Mathematics 128A-128B (128B may be taken concurrently), or consent of instructor. Approximate analysis procedures; Galerkin and stationary principle methods. Construction of approximate solutions by the finite element method. Applications to one- and two-dimensional problems in engineering. Introduction to time dependent, non-linear and three-dimensional problems, and other approximation procedures.

212B. Finite Elements: Application to Linear and Nonlinear Structural Mechanics Problems (3) III. Herrmann

Lecture—3 hours. Prerequisite: course 212A. Application of the finite element method to linear and nonlinear, one-, two-, and three-dimensional problems in continuum mechanics, soil mechanics, and to plate and shell theories.

***212C. Finite Elements: Application to Fluid Problems** (3) III. Larock

Lecture—3 hours. Prerequisite: courses 141, 212A. Application of the finite element method to two- and three-dimensional fluid flow problems, including inviscid and viscous flow, convection-diffusion problems, the shallow water equations, and flow through porous media. Class lectures and independent study and projects. Offered in alternate years.

213. Analysis of Structures Subjected to Dynamic Loads (3) III. Romstad

Lecture—3 hours. Prerequisite: courses 138, 211. Analysis of structures subjected to earthquake, wind, and blast loading; distributed, consistent and lumped mass techniques; development of a computer program for complex structures; nonlinear response spectrum analysis; frequency and time domain analysis.

221. Theory of Plates and Introduction to Shells (3) I. Herrmann

Lecture—3 hours. Prerequisite: course 201 (may be taken concurrently). Development of classical and refined plate theories. Application to isotropic, orthotropic and composite plates. Solutions for rectangular and circular plates. Membrane theory for axisymmetric shells and bending of circular shells.

232. Advanced Topics in Concrete Structures (3) I. Ramey

Lecture—3 hours. Prerequisite: course 132B. Ductility of reinforced concrete; design for torsion of structural concrete; seismic requirements; two-way slabs.

233. Advanced Design of Steel Structures (3) II. Ramey

Lecture—3 hours. Prerequisite: courses 132A and 131A. Design considerations for steel column and frame buckling; steel-plate girder design; steel-concrete composite design; design of connections. Design basis follows the AISC'S, LRFD, and ASD specifications.

240. Water Quality (3) II. The Staff

Lecture—3 hours. Prerequisite: courses 141 and 142. Quality requirements for beneficial uses of water. Hydrologic cycle of quality. Hydromechanics in relation to quality of surface and ground-waters; transport and fate of waterborne pollutants. Predictive methods, introduction to water quality modeling.

242. Air Quality (3) III. Chang

Lecture—3 hours. Prerequisite: Engineering 105A; courses 141 and 149, or the equivalent. Factors determining air quality. Effects of air pollutants. Physical and chemical fundamentals of atmospheric transport and reaction. Introduction to dispersion modeling.

243A. Water and Waste Treatment (3) I. Schroeder
Lecture—3 hours. Prerequisite: course 148A. Characteristics of water- and airborne wastes; treatment processes and process kinetics; treatment system design.

243B. Water and Waste Treatment (3) II. Schroeder
Lecture—3 hours. Prerequisite: course 243A; consent of instructor. Continuation of course 243A.

***244. Environmental Quality Modeling** (3) III. The Staff

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 240 or 242A. Mathematical modeling of environmental water quality, with emphasis on mathematical models of quality, their structure, capabilities and limitations, sensitivity and reliability as analytical and/or predictive tools. Offered in alternate years.

245. Applied Environmental Chemistry (4) III. Darby

Lecture—4 hours. Prerequisite: Engineering 105A, courses 140 and 140L or the equivalent, Chemistry 2A, 2B, or the equivalent; Chemistry 5 or 2C or 107A recommended. Chemistry of natural and polluted waters. Chemical kinetic and equilibrium principles, thermodynamics, carbonate systems, precipitation and dissolution, coordination chemistry, oxidation reduction, and interfacial phenomena.

246. Pilot Plant Laboratory (3) II. Darby
Lecture—1 hour; laboratory—6 hours. Laboratory investigation of physical, chemical, and biological processes for water and wastewater treatment.

247. Airborne Particles and Scavenging Mechanisms (3) I. Raabe

Lecture—3 hours. Prerequisite: course Engineering 105A and 103A, and courses 141, 149. Generation, characterization and behavior of small particles and droplets suspended in gas, including deposition and scavenging of airborne particles in the earth's atmosphere. Former course 242B.

247L. Airborne Particles Laboratory (1) I. Raabe
Laboratory—3 hours. Prerequisite: course 247 (may be taken concurrently). Laboratory exercises designed to familiarize the student with methods generation and characterization of airborne particles. Offered in alternate years. (Former course 242BL.)

248A. Design of Natural Systems for Wastewater Treatment (3) III. Smith

Lecture—3 hours. Prerequisite: courses 243A, 243B. Procedures are presented for the design of natural aquatic and soil-based systems for treatment of municipal and industrial wastewaters. Emphasis is placed on the practical application of principles developed in core courses 243A and 243B plus new information related to natural systems. Offered in alternate years.

***248B. Wastewater Reclamation and Re-use: Theory and Practice** (3) III. Asano

Lecture—3 hours. Prerequisite: course 243A, 243B. Wastewater reuse in water resources planning. Wastewater reuse practices in agricultural and landscape irrigation, industry, groundwater recharge, recreational and environmental uses, and potable water reuse. Selection of reclamation technologies. Assessment of health risks and health risk mitigation. Offered in alternate years.

250. Urban Transportation and Land Use Policy and Planning (3) III. Mokhtarian

Lecture—3 hours. Prerequisite: course 251. Historical and current relationships between transportation and land use. Traditional land use models. Role of land use in urban transportation modeling. Relationship between energy consumption and urban form. Impact of telecommunications on urban form. Policies involving transportation/land use relationships.

251. Transportation Demand Analysis (3) I. The Staff

Lecture—3 hours. Prerequisite: course 114 or the equivalent. Detailed discussions of a standard procedure used in urban passenger travel demand forecasting. Principles and assumptions of the model components (trip generation, trip distribution, and modal split). Computer exercises using empirical data to calibrate models and forecast travel demand.

***253. Transportation Safety Analysis** (3) III. Jovanis

Lecture—3 hours. Prerequisite: course 114, 254. Human and vehicle factors in accident occurrence. Evaluation of safety investments; regression to the

mean. Development of statistical models of accident occurrence. Offered in alternate years.

254. Discrete Choice Analysis of Travel Demand (3) II. Mokhtarian

Lecture—3 hours. Prerequisite: course 114 or the equivalent. Behavioral and statistical principles underlying the formulation and estimation of discrete choice models. Practical application of discrete choice models to characterization of choice behavior, hypothesis testing, and forecasting. Emphasis on computer exercises using large-scale data sets obtained from home interview surveys.

255. Transportation Survey Methods (3) I. Mokhtarian

Lecture—3 hours. Prerequisite: course 251 or consent of instructor. Description of types of surveys commonly used in transportation demand modeling, including home-interview, travel diary, panel, attitudinal, conjoint, and stated-preference surveys. Discussion of sampling, experimental design, and survey design issues. Analysis methods, including factor, discriminant, cluster, conjoint, and stated-preference analysis.

256. Urban Traffic Management and Control I (3) II. Jovanis

Lecture—3 hours. Prerequisite: graduate standing. Nature of urban vehicular traffic congestion; roadway capacity; intersection design and traffic signal operations; freeway operations and management; corridor control.

257. Urban Traffic Management and Control II (3) III. Jovanis

Lecture—3 hours. Prerequisite: course 256. Microscopic and macroscopic traffic stream models; traffic signal delay models; queuing theory applications. Traffic surveillance and detection; traffic forecasting; applications to traffic control systems. Offered in alternate years.

258. Transportation Planning in Developing Countries (3) III. Sperling

Lecture—3 hours. Prerequisite: course 160 or consent of instructor. Investigation of the role that transportation investments and policies play in the development of regions and countries. Emphasis is on identifying appropriate technologies, policies, and planning methods for designing transportation systems in regions of differing socioeconomic, geographic, and institutional settings. Offered in alternate years.

259. Advanced Highway Technology and Automation (3) I. Jovanis

Lecture—3 hours. Prerequisite: graduate standing. Technologies covered include vehicle navigation and guidance, telecommunications and information systems, and highway electrification. Analysis and evaluation of policy implementation issues, driver response and pricing strategies and costs, and formulation of control theory.

***260. Noncohesive Sediment Transportation** (3) II. The Staff

Lecture—3 hours. Prerequisite: course 141. Sediment materials. Particle suspension by currents, waves, and winds. Modes of transport. Bed load relations and suspended load relations. Calculation of total loads in streams. Similarity criteria for movable bed models. Stable channel design. Offered in alternate years.

***261. Cohesive Particle Transportation** (3) III. The Staff

Lecture—3 hours. Prerequisite: course 141. Cohesion; cohesive particulate materials; processes of aggregation and dispersion; aggregate properties; deposition and scour, channel and harbor design and maintenance. Offered in alternate years.

266A. Applied Stochastic Methods in Engineering (3) I. Kavvas

Lecture—3 hours. Markov processes and their applications to modeling of engineering systems. Review of differential Smolukowski-Chapman-Kolmogorov equations, Brownian motion and Ornstein-Uhlenbeck processes within the framework of statistical diffusion theory and their engineering applications to pollution transport problems.

266B. Applied Stochastic Methods in Engineering (3) II. Kavvas

Lecture—3 hours. Stochastic differential equations and their applications to the solution of engineering problems. Offered in alternate years.

267. Water Resources Management (3) I. Lund

Lecture—3 hours. Prerequisite: basic probability (course 114 or the equivalent) and courses 141 and 142; course 153 recommended. Operation, maintenance, and modification of existing water resource systems; engineering, economic, financial, legal, and institutional considerations; decision, optimization, and multi-objective analysis.

268. Public Works Economics (3) II. Lund

Lecture—3 hours. Prerequisite: Engineering 106 or Agricultural Economics 148; Economics 1A. Engineering economics applied to public works planning, operations, and maintenance problems; microeconomic and macroeconomic theories; benefit-cost analysis; effect of uncertainty; optimization economics; non-classical economics; public finance. Offered in alternate years.

***269. Water Supply and Hydroelectric Power Planning** (3) II. The Staff

Lecture—3 hours. Prerequisite: courses 142 and 152 or the equivalent. Analysis of drought phenomena and low streamflow; water demand; risk and reliability analysis; conjunctive supply and conservation; planning alternatives. Capacity and energy determination; operations studies; planning alternatives; market requirements and load studies; analysis of system power and supply; regulatory considerations. Offered in alternate years.

***270. Advanced Water Resources Management** (3) III. Lund

Lecture—3 hours. Prerequisite: courses 153 and 267 or the equivalent. Discussion of technical papers related to planning theory, system maintenance, regionalization, multi-objective methods, risk analysis, institutional issues, pricing model application, economic development, forecasting, operations, and other topics. Offered in alternate years.

271. Water Resources Planning Laboratory (3) III. The Staff

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 142, 152. Application of hydrology, hydraulics, systems analysis, economics and principles of plan formulation and plan evaluation in conducting a water resources planning study. Lectures provide instruction on principles and methodology used in the laboratory study. Offered in alternate years.

272A. Advanced Groundwater Hydrology (3) II. Mariño

Lecture—3 hours. Prerequisite: course 144 or the equivalent; Mathematics 118A recommended. Flow in confined, unconfined, and leaky aquifers. Hydraulics of pumping and recharging wells. Identification of aquifer parameters. Groundwater quality problems.

***272B. Advanced Groundwater Hydrology** (3) III. King

Lecture—3 hours. Prerequisite: course 272A and 212A or the equivalent. Numerical methods of fluid flow systems. Flow in the unsaturated zone. Hydrodynamic dispersion. Fresh-water and salt-water interface in coastal aquifers. Identification of regional aquifer parameters. Modeling of aquifer systems. Offered in alternate years.

273. Water Resource Systems Engineering (3) I. Mariño

Lecture—3 hours. Prerequisite: courses 114 and 153 or the equivalent. Planning, design, and management of water resource systems. Application of deterministic and stochastic optimization techniques. Water allocation, capacity expansion, and design and operation of reservoir systems. Surface water and groundwater management. Offered in alternate years.

***274. Hydraulics of Pipe Lines** (3) II. Larock

Lecture—3 hours. Prerequisite: course 141; Engineering 5. Mechanics of liquid flow in pipes and pipe network systems. Steady flow, unsteady flow, surge and water-hammer problems. Manifold flow. Offered in alternate years.

275. Hydrologic Time-Series Analysis (3) III. Kavvas

Lecture—3 hours. Prerequisite: Engineering 118 and course 142 or the equivalent. Application of statistical methods for analysis and modeling of hydrologic series. Statistical simulation and prediction of hydrologic sequences using time series methodology. Offered in alternate years.

276. Watershed Hydrology (4) II. Kavvas

Lecture—4 hours. Prerequisite: course 142 or the equivalent. Analysis and mathematical modeling of hydrologic processes taking place in a watershed. Precipitation analysis and modeling. Theory of overland flow and its kinematic wave approximation. Analysis and modeling of saturated and unsaturated subsurface flow processes taking place on a hill slope.

277. Unsteady Flow in Surface Waters (3) I. King

Lecture—3 hours. Prerequisite: course 141; Applied Science Engineering 115 (may be taken concurrently). Long waves in surface flow. Shallow water equations. Saint Venant equations. Method of characteristics. Explicit and implicit finite element methods; stability of numerical schemes. Flood routing. Bores. Dam break.

278. Hydrodynamics (3) II. Larock

Lecture—3 hours. Prerequisite: course 141. Equations for conservation of mass, momentum, energy; vorticity, circulation; stream functions, velocity potential; flows by superposition and conformal mapping; free streamline applications, gravity effects; introduction to wave motion. Offered in alternate years.

279. Advanced Mechanics of Fluids (4) I. Larock

Lecture—4 hours. Prerequisite: course 141. Rotational flows. Navier-Stokes equations and solutions for laminar flow; boundary layer equations and solution techniques. Nature of turbulence. Reynolds equations. Introduction to turbulence modeling. Offered in alternate years.

281A. Advanced Soil Mechanics (3) I. Idriss

Lecture—3 hours. Prerequisite: course 171. Consolidation and secondary compression. Seepage and seepage pressures. Shear strength: friction, cohesion, dilatancy, and critical states.

281B. Advanced Soil Mechanics (3) II. Kutter

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 281A. Site investigation methods: CPT, SPT, pressuremeter, vane, seismic investigation, electrical properties. Slope stability, including seepage pressures and earthquake effects. Centrifuge modeling.

283. Physicochemical Influences and In Situ Evaluation of Soil Behavior (3) II. Arulanandan

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 171. Analysis of the mechanical behavior of soils from consideration of clay mineralogy, colloidal phenomena, ion-exchange. Soil-water-electrolyte characteristics and soil structure. Laboratory includes methods of characterization of soils, quantification of soil structure, and rotating cylinder tests to evaluate soil erosion.

284. Theoretical Soil Mechanics (3) II. Kutter

Lecture—3 hours. Prerequisite: course 171, 281A. Elasticity, plasticity, and critical state soil mechanics. Prediction of stress-strain-volume change behavior of soils. Monotonic and cyclic loading, anisotropy, and strain-rate effects. Numerical implementation of constitutive models.

285A. Soil Modification (3) I. Idriss

Lecture—3 hours. Prerequisite: course 171. Purposes, principles, and methods of soil modification for various geotechnical applications. Offered in alternate years.

***285B. Pavement Systems Design** (2) I. Arulanandan

Lecture—2 hours. Prerequisite: course 171. Principles and methods of pavement design for highways and airfields. Offered in alternate years.

286. Advanced Foundation Design (3) III. Idriss

Lecture—3 hours. Prerequisite: course 173. Design and analysis of bulkheads; deep excavation; tie-back systems; coffer dams; loads on buried conduits; lateral pile loading capacity; pier foundations; and other related topics.

287. Geotechnical Earthquake Engineering (3) III. Idriss

Lecture—3 hours. Prerequisite: course 138, 281A. Characteristics of earthquake ground motions; empirical and simulation procedure for estimating these motions; local site response; liquefaction potential; residual strength and stability consideration; generation and dissipation of pore water pressures; settlement.

288. Earth and Rockfill Dams (3) II. Idriss

Lecture—3 hours. Prerequisite: course 281A, 281B. Site selection; preliminary design considerations; layout; seismic effects including considerations of fault movements; construction; instrumentation; maintenance.

289A-1. Selected Topics in Civil Engineering (1-5) I, II, III. The Staff (Chairperson in charge)

Lecture, laboratory, or combination. Prerequisite: consent of instructor. Directed group study of special topics with separate sections in (A) Environmental Engineering; (B) Hydraulics and Hydrologic Engineering; (C) Engineering Planning; (D) Geotechnical Engineering; (E) Structural Engineering; (F) Structural Mechanics; (G) Transportation Engineering; (H) Transportation Planning; (I) Water Resources Engineering. May be repeated for credit.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour. Discussion of current graduate research, and guest lectures on recent advances. Oral presentation of individual study. Course required of graduate degree candidates. (S/U grading only.)

290C. Graduate Research Group Conference (1) I, II, III. Chairperson in charge

Discussion—1 hour. Research problems, progress, and techniques in civil engineering. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

Professional Course**390. The Teaching of Civil Engineering** (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in Civil Engineering. Participation as teaching assistant or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated for total of 9 units. (S/U grading only.)

Engineering: Computer Science

(College of Engineering)

Peter Linz, Ph.D., Acting Chairperson of the Department

Department Office, 2063 Engineering II
(916-752-7004)

Faculty

Sergio Alvarado, Ph.D., Assistant Professor
Matthew Bishop, Ph.D., Assistant Professor
Matthew K. Farrens, Ph.D., Assistant Professor
Daniel Gusfield, Ph.D., Professor
Kenneth I. Joy, Ph.D., Associate Professor
Karl Levitt, Ph.D., Professor
Peter Linz, Ph.D., Professor
Charles U. Martel, Ph.D., Professor
Norman S. Matloff, Ph.D., Professor
Biswanath Mukherjee, Ph.D., Associate Professor
Ronald A. Olsson, Ph.D., Associate Professor
Arvin Park, Ph.D., Assistant Professor
Armand E. Prieditis, Ph.D., Assistant Professor

Manfred G. Ruschitzka, Ph.D., Professor
Richard F. Walters, Ph.D., Professor

Emeriti Faculty

Lawrence T. Kou, Ph.D., Professor Emeritus

Courses in Engineering: Computer Science (ECS)

Lower Division Courses

10. Basic Concepts of Computing (4) I, II, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: two years of high school algebra. Introduction to principles of computing. Methods and algorithms for solving problems by use of a digital computer. Not intended for students in physical sciences, engineering, or mathematics. (Not open for credit to students who have completed course 30 or 35, Engineering 5, or former course 30H.)

15. Introduction to Computers (4) I, II, III. Walters
Lecture—3 hours; laboratory—3 hours. Computer uses in modern society. Emphasis on uses in non-scientific disciplines. Includes word processing, other applications, elementary programming concepts, overview of current/projected computer uses. Intended for students in the College of Letters and Science and other non-computer science majors. Not open for credit to students who have completed course 30, 35, Engineering 5 or former course 30H. General Education credit: Nature and Environment.

30. Introduction to Programming and Problem Solving (4) I, II, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16A or 21A (may be taken concurrently). Introduction to computers and computer programming, algorithm design, running, debugging and testing of well-structured programs. Programming language Pascal will be used to solve problems. (Not open to students who have completed course 10, 35 or former course 30H. Only two units of credit allowed for students who have completed Engineering 5.)

*35. Structure and Interpretation of Computer Programs (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Computer Science or Electrical Engineering major, Mathematics 16A or 21A (may be taken concurrently), knowledge of Pascal or C. Mathematical foundations of computer science. Procedural and data abstraction. Design and analysis of algorithms. The Scheme programming language is used. Not open for credit to students who have completed course 10, 30, Engineering 5, or former course 30H. Intended for students who have been introduced to a high-level programming language in high school.

40. Introduction to Software Development (4) I, II, III. The Staff

Lecture—3 hours; discussion 1—hour. Prerequisite: course 30 or 35. Elements of program design, style, documentation, efficiency. Methods for debugging and verification. Application of dynamic data structures. Introduction to programming language C.

50. Computer Organization and Machine-Dependent Programming (4) II, III. Farrens, Matloff, Park

Lecture—3 hours; discussion—1 hour. Prerequisite: course 40. Comparative study of different hardware architectures via programming in the assembly languages of various machines. Role of system software in producing an abstract machine. Only one unit of credit allowed for students who have taken Electrical and Computer Engineering 70.

89A-L. Special Topics in Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)

Lecture, laboratory or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science Theory; (B) Architecture; (C) Programming Languages and Compilers; (D) Operating Systems; (E) Software Engineering; (F) Data Bases; (G) Artificial Intelligence; (H) Computer Graphics; (I) Networks; (J) Computer-Aided Design; (K) Scientific Computing; (L) Computer Science. May be repeated for credit when the topic is different.

90X. Lower Division Seminar (2) I, II, III. The Staff (Chairperson in charge)

Seminar—2 hours. Prerequisite: lower division standing. Examination of a special topic in a small group setting.

92. Internship in Computer Science (1-5) I, II, III. The Staff

Internship. Prerequisite: lower division standing; project approval prior to period of internship. Supervised work experience in computer science. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses

100. Discrete Structures (3) I, II, III. The Staff

Lecture—3 hours. Prerequisite: Mathematics 21C. Discrete structures and applications to various areas of computer science; mathematical models and mathematical reasoning, sets, relations, functions, methods of counting.

110. Data Structures and Programming (4) I, II, III. Linz, Martel, Joy

Lecture—3 hours; discussion—1 hour. Prerequisite: course 40. Design and analysis of data structures for a variety of applications. Concept of abstract data-types, their representation. File structures. Dynamic information structures, linear lists, tree structures. Hash techniques. Recursive algorithms. Sorting and searching. Object-oriented techniques for data representation, implementation.

120. Automata Theory and Formal Languages (3) I, II. Linz

Lecture—3 hours. Prerequisite: course 100. Theory of computation; abstract models of digital computers; finite automata, pushdown automata, Turing machines and other models of computation. Formal languages and their relation to programming languages; regular and context-free grammars; parsing and ambiguity.

122A. Algorithm Design and Analysis (3) II, III. Martel, Gusfield

Lecture—3 hours. Prerequisite: courses 100, 110. Complexity of algorithms, bounds on complexity, algorithms for searching, sorting, pattern matching, graph manipulation, combinatorial problems, introduction to NP-complete problems. Not open for credit to students who have taken Computer Science Engineering 122.

122B. Algorithm Design and Analysis (3) I. Gusfield, Martel

Lecture—3 hours. Prerequisite: course 122A. Theory and practice of hard problems, and problems with complex algorithmic solutions. NP-completeness, approximation algorithms, randomized algorithms, dynamic programming and branch and bound. Students do theoretical analysis, implementation and practical evaluations. Examples from parallel, string, graph, and geometric algorithms.

140A. Programming Languages (4) I, II. Olsson

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Syntactic definition of programming languages. Introduction to programming language features including variables, data types, data abstraction, scoping, parameter disciplines, exception handling. Comparative study of several high-level languages. Not open for credit to students who have taken Computer Science Engineering 140.

140B. Programming Languages (4) II. Olsson, Levitt

Lecture—3 hours; discussion—1 hour. Prerequisite: course 140A. Continuation of programming language principles. Further study of programming language paradigms such as functional and logic; additional programming language paradigms such as concurrent (parallel), dataflow, and constraint; key implementation issues for those paradigms; and programming language semantics.

142. Compilers (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 120 and 140A; course 160 recommended. Principles and techniques of lexical analysis, parsing, semantic analysis, and code generation. Implementation of compilers.

150. Operating Systems and System Programming (4) I, III. Levitt, Matloff, Olsson

Lecture—3 hours; discussion—1 hour. Prerequisite: course 40, and course 154A or Electrical and Computer Engineering 70; course 154B or Electrical and Computer Engineering 170 strongly recommended. Basic concepts of operating systems and system programming. Processes and interprocess communication/synchronization; virtual memory, program loading and linking; file and I/O subsystems; utility programs. Study of a real operating system.

151A. Operating System Design (4) II. Ruschitzka

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 154A or Electrical and Computer Engineering 170. Architectural support of operating system concepts. Systems programming. Major components of an operating system, their functions, and their interactions. Lecture material is closely coupled with a project that involves a machine simulator and the implementation of a matching multi-programming system. (Not open to students who have taken Electrical and Computer Engineering 182A.)

151B. Operating System Design (3) III. Ruschitzka

Lecture—3 hours. Prerequisite: course 151A and an introductory probability course. Contemporary architectures: virtual memory and operating system support functions. Concurrent processes and the problems of determinacy, mutual exclusion, deadlocks, and synchronization. Management of physical and virtual resources. Protection mechanisms. User interface and ease-of-use considerations. (Not open to students who have taken Electrical and Computer Engineering 182B.)

152. Introduction to Computer Networks (3) I, III. Matloff, Mukherjee

Lecture—3 hours. Prerequisite: course 154A or Electrical and Computer Engineering 170. Overview of local and wide-area computer networks. ISO seven-layer model. Physical aspects of data transmission. Data-link level protocols. Transport and application. Local area networks.

154A. Computer Architecture (4) I, II. Farrens, Matloff, Mukherjee, Park

Lecture—3 hours; discussion—1 hour. Prerequisite: course 50 or Electrical and Computer Engineering 70, and course 110. Introduction to digital design. Interfacing of devices for I/O, memory and memory management. Input/output programming, via wait loops, hardware interrupts and calls to operating system services. Hardware support for operating system software. Only one unit of credit allowed for students who have taken Electrical and Computer Engineering 170.

154B. Computer Architecture (4) II, III. Farrens, Matloff, Park

Lecture—3 hours; discussion—1 hour. Prerequisite: course 154A or Electrical and Computer Engineering 170, and course 110. Hardwired and microprogrammed CPU design. Memory hierarchies. Uniprocessor performance analysis under varying program mixes. Introduction to pipelining and multiprocessors.

158. Programming on Parallel Architectures (3) III. Matloff, Farrens, Park

Lecture—3 hours. Prerequisite: course 154B or Electrical and Computer Engineering 170; and course 150 or 151A. Techniques for software development on shared-memory and message-passing architectures. Overview of interconnect architectures, and hardware for memory-access atomicity. Spin locks and barriers. Load balancing. Efficient use of interconnects and memory.

160. Introduction to Software Engineering (4) II, III. Levitt

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 110 and 140A. Requirements, specification, design, implementation, testing, and verification of large software systems. Study and use of software engineering methodologies. Team programming.

163. User/Computer Interfaces (4) III. Joy
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100, 110. Study of the principles of user/computer interaction. User interface management system architecture; semantics of input devices; transition network and event-based systems, models of interaction, graphical interfaces; implementations; and performance issues and tradeoffs.

165A. Database Systems (4) II. Walters
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Database hardware; input techniques; file types; database models; reliability, integrity and security; operating system interfaces with databases.

165B. Database Systems (4) III. Walters
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 165A. Continuation of basic principles of databases. Distributed systems; transaction processing; knowledge representation; new database models, including object-oriented; performance evaluation; optimization.

167. Databases in Humanities and Sciences (4) III. Walters

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 15 or the equivalent. Introduction for non-majors to basic principles of database management systems; overview of typical commercial database packages; use of database systems in various fields in humanities and sciences; design and implementation of individual database applications. Not open for credit to College of Engineering students. General Education credit: Nature and Environment.

168. Information Systems (3) I. Walters
Lecture—3 hours. Prerequisite: course 40 or the equivalent; upper division standing. Design, creation, implementation, and case study evaluation of information systems. Project-oriented, self-paced implementation of actual information including survey collection of data, input design, and development of components to edit, sort, and retrieve data. Case study of typical information systems problems. Offered in alternate years.

170. Introduction to Artificial Intelligence (4) II. Levitt, Prieditis

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 110, 140A. Design and implementation of intelligent computer systems. Knowledge representation and organization. Memory and inference. Problem solving. Natural language processing.

172. Natural Language Processing (4) I. Alvarado
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110; course 140A recommended. Introduction to cognitive modeling. Study of knowledge structures and processes required for computer comprehension of human languages. Conceptual analysis based on Conceptual Dependency Theory, scripts, goals, and plans. Techniques for designing and implementing natural language parsers and generators.

175. Computer Graphics (4) I, II. Joy
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110, Mathematics 22A. Principles of computer graphics. Current graphics hardware, elementary operations in two- and three-dimensional space, transformational geometry, clipping, graphics system design, standard graphics systems. Individual projects.

189A-L. Special Topics in Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)

Lecture, laboratory or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science Theory; (B) Architecture; (C) Programming Languages and Compilers; (D) Operating Systems; (E) Software Engineering; (F) Data Bases; (G) Artificial Intelligence; (H) Computer Graphics; (I) Networks, (J) Computer-Aided Design; (K) Scientific Computing; (L) Computer Science. May be repeated for credit when the topic is different.

190C. Research Group Conferences in Computer Science (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: upper division standing in Computer Science and Engineering; consent of instructor. Research group conferences. May be repeated for credit. (P/NP grading only.)

190X. Senior Seminar (2) I, II, III. The Staff (Chairperson in charge)
Seminar—2 hours. Prerequisite: senior standing. Examination of a special topic in a small group setting.

192. Internship in Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)
Internship. Prerequisite: completion of a minimum of 84 units; project approval prior to period of internship. Supervised work experience in computer science. May be repeated for credit. (P/NP grading only.)

197T. Tutoring in Computer Science (2-3) I, II, III. Walters

Discussion—1 hour; laboratory—3-6 hours. Prerequisite: upper division standing and consent of instructor. Tutoring in computer science courses, especially introductory computing. For upper division undergraduate students who will provide tutorial assistance. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

220. Theory of Computation (3) III. Linz
Lecture—3 hours. Prerequisite: courses 120 and 122A. Theory of computation: the notion of effective procedures, computability, Turing machines, Post symbol manipulation system, models similar to digital computers, computational complexity and intractable problems.

***221. Formal Language Theory** (3) III. Linz
Lecture—3 hours. Prerequisite: course 220. Definition and properties of formal languages, deterministic context-free languages, context-sensitive languages, abstract families of languages, special topics of current interest.

222A. Design and Analysis of Algorithms (3) I. Gusfield, Martel

Lecture—3 hours. Prerequisite: course 122A; Statistics 131A recommended. Techniques for designing efficient algorithms and analyzing their complexity. Use of data structures. Counting and estimating. Search techniques. Graph algorithms.

222B. Advanced Design and Analysis of Algorithms (3) II. Gusfield, Martel

Lecture—3 hours. Prerequisite: course 222A. Advanced topics in complexity theory. Problem classification. The classes P, NP, P-space, co-NP. Matching and network flow algorithms. Matrix multiplication. Approximation algorithms. Selected advanced topics. (Not open for credit to students who have completed former Electrical and Computer Engineering 277B.)

223. Parallel Algorithms (3) II. Martel

Lecture—3 hours. Prerequisite: course 222A. Models of parallel computer systems including PRAMs, loosely coupled systems and interconnection networks. Parallel algorithms for classical problems are studied as well as general techniques for their design and analysis. Lower bounds on parallel computation are proved in several settings.

225. Graph Theory (3) II. Hakimi

Lecture—3 hours. Prerequisite: graduate standing in electrical engineering or computer science or consent of instructor. Fundamental concepts. Vector spaces and graphs. Planar graphs: Whitney's and Kuratowski's theorems. Topological parameters: packings and coverings. Connectivity: Menger's theorem. Hamilton graphs: Posa's and Chvatal's theorems. Graph factorization: Tutte's theorem. Graph coloring: Brooks; and Vizing's theorem.

226. Computational Algorithms in VLSI (3) I. The Staff

Lecture—3 hours. Prerequisite: course 122A, Electrical and Computer Engineering 180A. Application and inherent limitations of using VLSI to implement computational algorithms; design and analysis of algorithms for the design of VLSI circuits; VLSI test set generation and simulation.

240. Programming Languages (3) II. The Staff
Lecture—3 hours. Prerequisite: courses 140A, 142. Advanced topics in programming languages, including formal syntax and semantics, the relation between formal semantics and verification, and an introduction to the lambda calculus. Additional topics may include language design principles, alternative programming language paradigm, or in-depth semantic theory.

242. Translation of Programming Languages (3) III. The Staff

Lecture—3 hours. Prerequisite: course 240. Lexical analysis, parsing, storage management, symbol table design, semantic analysis and code generation. LR, LALR grammars. Compiler-compilers. (Not open for credit to students who have completed former Electrical and Computer Engineering 278B.)

243. Code Generation and Optimization (3) I. The Staff

Lecture—3 hours. Prerequisite: course 242. Advanced code generation techniques. Representation of intermediate code. Data flow analysis, code movement, loop optimization, common subexpression elimination, and peephole optimization. Optimization by program transformation. (Not open for credit to students who have completed former Electrical and Computer Engineering 278C.)

244. Principles of Concurrent Programming (3) I. Olsson

Lecture—3 hours. Prerequisite: course 100; and course 150 or 151B. Fundamental concepts and applications of concurrent programs; concurrent program verification and derivation; synchronization mechanisms in programming languages; distributed programming techniques; case studies of languages.

***247. Parallel Languages** (3) II. The Staff

Lecture—3 hours. Prerequisite: course 240. Language constructs for parallel computation in functional-programming, logic-programming, and related languages. Representation and implementation of task spawning and synchronization. Forms of parallelism, including explicit vs. implicit, AND vs. OR, and All-Solutions vs. Committed-Choice. Techniques of data flow, suspensions, graph reduction, backtracking, difference lists, etc. Mapping to architectures.

250A. Advanced Computer Architecture (3) I. Matloff

Lecture—3 hours. Prerequisite: course 154B or Electrical and Computer Engineering 170; course 150 or 151A. Introduction to modern research topics and methods in computer architecture. Design implications of memory latency and bandwidth limitations. Performance enhancement via within-processor and between-processor parallelism. Term project involving student-proposed extension/modifications of work in the research literature.

250B. High-Performance Uniprocessing (3) II. Farnes

Lecture—3 hours. Prerequisite: course 250A. Maximizing uniprocessor performance. Barriers to high performance; solutions to the problems; historical and current processor designs.

250C. Parallel Processing (3) III. Park

Lecture—3 hours. Prerequisite: course 250A. Using parallelism to increase computational speed. Interconnection topologies; parallel programming paradigms; architecture-specific algorithms; synchronization; parallel operating systems.

251. Operating System Models (3) III. Ruschitzka
Lecture—3 hours. Prerequisite: course 151B; Introductory probability theory course. A survey of formal models that are used in the study of operating systems. Modeling of parallel processes and their synchronization in terms of practical orderings and Petri nets. Deterministic and probabilistic models for the evaluation of system performance measures.

252. Local Area Networks (3) II. Mukherjee
Lecture—3 hours. Prerequisite: course 152. Local area networks and their functions, structures, and access protocols. Emphasis on performance modeling and analysis of multiaccess techniques in polling, ring, and random access networks. Also discussed are standards, example products, and recent directions in research.

253. Cryptography and Data Security (3) I. Levitt
Lecture—3 hours. Prerequisite: course 150; consent of instructor. Methods of protecting data in computer and communication systems from unauthorized disclosure and modification. Introduction to mathematical principles of security with applications to operating systems, database systems, and computer networks.

256A. Analytic Methods for Computer Systems Design (3) I. Matloff
Lecture—3 hours. Prerequisite: course 100, 154A-154B or Electrical and Computer Engineering 170, and Statistics 131A or the equivalent; course 150 or 151A-151B recommended. Use of simulation and queueing theory in computer design. Applications to memory hierarchies; file storage; computer networks; fault-tolerance; scheduling.

256B. Modeling and Analysis of Computer Networks (3) III. Matloff
Lecture—3 hours. Prerequisite: course 256A. Use of simulation and queueing theory in the design of wide-area and local computer networks, with particular emphasis on optimization. Multiple access protocols, capacity planning, topological design, flow/congestion control, routing.

260. Software Engineering (3) I. Levitt
Lecture—3 hours. Prerequisite: courses 140A, 160. Advanced techniques for program specification, design, implementation, testing, and documentation. Application of techniques to large-scale software systems.

261. Program Verification (3) I. The Staff
Lecture—3 hours. Prerequisite: Mathematics 125 or Philosophy 112 or familiarity with first-order logic. Knowledge of an iterative and a functional programming language. Methods of proving correctness of programs with respect to formal specifications, with attention to those suited for employing automated deduction. Logic background, symbolic execution, techniques suited to iterative programming, methods from denotational semantics, termination, dynamic logic and proofs of concurrent programs.

***262. Formal Specification** (3) II. The Staff
Lecture—3 hours. Prerequisite: course 261. Formal specification of modules, and its relationship to top-down programming development and verification. Abstract data types, together with methods for specifying them. Implementations and proofs of implementation. Using specifications to reason about programs. Parameterized types. Constructing good formal specifications. Offered in alternate years.

265. Database Systems (3) III. Walters
Lecture—3 hours. Prerequisite: course 165A. Data models (especially relational and entity relation), performance measures, query languages and optimizers, data base security and integrity, and distributed systems.

269. Evolution of a Computer Language (3) I. Walters
Lecture—3 hours. Prerequisite: course 140A. Review of a specific language: history, features, implementation techniques, validation procedures, performance evaluation and applications. Projects in programming, meta language implementation, validation and performance measures.

270. Artificial Intelligence (3) II. Alvarado
Lecture—3 hours. Prerequisite: course 140A, 172. Concepts and techniques underlying the design and implementation of models of human performance on intelligent tasks. Representation of high-level knowledge structures. Models of memory and inference. Natural language and story understanding. Common sense planning and problem solving.

271. Machine Learning and Discovery (3) III. Priedtis
Lecture—3 hours. Prerequisite: course 170 or the equivalent. Artificial intelligence techniques for knowledge acquisition by computers. Fundamental problems in machine learning and discovery. Systems that learn from examples, analogies, and solved problems. Systems that discover numerical laws and qualitative relationships. Projects centering on implementation and evaluation.

272. Cognitive Modeling (3) III. Alvarado
Lecture—3 hours. Prerequisite: courses 172 and 270. Current issues in artificial intelligence emphasizing the modeling and simulation of human performance. Discussion and implementation of current methods in knowledge representation, memory processes and organization, natural language understanding, and planning and problem solving.

***274. Automated Deduction** (3) III. The Staff
Lecture—3 hours. Prerequisite: Mathematics 125 or Philosophy 112 or familiarity with first-order logic. Techniques of mechanical theorem-proving. Methods based on resolution and term-rewriting. Decision procedures. Induction. Applications to program verification, question/answering and plan generation. Offered in alternate years.

275. Computer Graphics (3) III. Joy
Lecture—3 hours. Prerequisite: course 175. Advanced topics in computer graphics. Hidden surface models, rendering of various surface types, subdivision methods, shading techniques, anti-aliasing, modeling techniques. Offered in alternate years.

276. Advanced Raster Graphics (3) III. Joy
Lecture—3 hours. Prerequisite: course 275. Advanced topics in raster graphics techniques. Ray tracing models, advanced modeling techniques, anti-aliasing, animation. Discussion of current research in the field. Offered in alternate years.

***278. Computer-Aided Geometric Design** (3) III. Joy
Lecture—3 hours. Prerequisite: course 175; Applied Science Engineering 115 or Mathematics 128A. Mathematical techniques for the definition and manipulation of curves and surfaces. Coon's patches, Bezier curves and surfaces. B-spline curves and surfaces, beta-splines, box-splines. Integration into various computer graphics rendering models, and computer-aided design systems.

289A-L. Special Topics in Computer Science (1-5) I, II, III. The Staff
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science Theory; (B) Architecture; (C) Programming Languages and Compilers; (D) Operating Systems; (E) Software Engineering; (F) Data Bases; (G) Artificial Intelligence; (H) Computer Graphics; (I) Networks; (J) Computer-Aided Design; (K) Scientific Computing; (L) Computer Science. May be repeated for credit when the topic is different.

290. Seminar in Computer Science (1) I, II, III. The Staff
Seminar—1 hour. Participating seminar; discussion and presentation of current research and development in computer science. (S/U grading only.)

290C. Graduate Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Research problems, progress and techniques in computer science. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
Lecture, laboratory, or combination. Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Professional Courses

315. Teaching Computer Science (3) II. Walters
Lecture—2 hours; discussion/laboratory—1 hour. Prerequisite: course 110. Fundamentals of instructional methodology applied to teaching computer science, especially at the introductory level. Behavioral objectives, testing methods, course design, evaluation, technology in instruction.

390. The Teaching of Computer Science (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in Computer Science. Participation as a teaching assistant or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated for credit. (S/U grading only.)

Engineering: Electrical and Computer Engineering

(College of Engineering)

S. Louis Hakimi, Ph.D., Chairperson of the Department

John N. Churchill, Ph.D., Vice Chairperson of the Department

Department Office, 2064 Engineering II
(916-752-0583)

Faculty

Khaled Abdel-Ghaffar, Ph.D., Assistant Professor
Venkatesh Akella, Ph.D., Assistant Professor
V. Ralph Algazi, Ph.D., Professor
Robert W. Bower, Ph.D., Professor
R. Branner, Ph.D., Associate Professor
Tsu-Shuan Chang, Ph.D., Associate Professor
John N. Churchill, Ph.D., Professor
K. Wayne Current, Ph.D., Professor
Andrew J. Dienes, Ph.D., Professor
Richard C. Dorf, Ph.D., Professor (*Electrical and Computer Engineering/Management*)
Kamilo Feher, Ph.D., Professor
Herman J. Fink, Ph.D., Professor
Gary E. Ford, Ph.D., Associate Professor, *Academic Senate Distinguished Teaching Award*
Benjamin Friedlander, Ph.D., Professor
William A. Gardner, Ph.D., Professor
Mohammed S. Ghausi, Ph.D., Professor
A. Nazli Gundes, Ph.D., Assistant Professor
S. Louis Hakimi, Ph.D., Professor
Stephen B. Haley, Ph.D., Professor
Jonathan P. Heritage, Ph.D., Professor
T.C. Steve Hsia, Ph.D., Professor
Charles E. Hunt, Ph.D., Associate Professor
Paul J. Hurst, Ph.D., Associate Professor
Andre Knoesen, Ph.D., Associate Professor
Bernard C. Levy, Ph.D., Professor
Stephen H. Lewis, Ph.D., Assistant Professor
David Q. Wayne, Ph.D., Professor
Vojin G. Oklobdzija, Ph.D., Assistant Professor
G.R. Redinbo, Ph.D., Professor
Todd R. Reed, Ph.D., Assistant Professor
Rosemary Smith, Ph.D., Associate Professor
Michael A. Soderstrand, Ph.D., Professor
Richard R. Spencer, Ph.D., Associate Professor
Jerome J. Suran, Ph.D. (hon.), Senior Lecturer (*Electrical and Computer Engineering/Management*)
Shih-Ho Wang, Ph.D., Professor
Kent D. Wilken, Ph.D., Assistant Professor

Emeriti Faculty

I. Horowitz, Ph.D., Professor Emeritus
Wen C. Lin, Ph.D., Professor Emeritus
Ronald F. Soohoo, Ph.D., Professor Emeritus

Courses in Engineering: Electrical and Computer Engineering (EEC)

Lower Division Courses

1. Introduction to Electrical and Computer Engineering (1) III. The Staff (Chairperson in charge)
Lecture—1 hour. Electrical and computer engineering as a professional activity. What electrical engineers know and how they use their knowledge. Problems they are concerned with and how they go about solving them. Presentation of basic ideas and their applications. Examination of some case studies. (P/NP grading only.)

70. Computer Structure and Assembly Language (4) I, III. Redinbo, Soderstrand, Wilken
Lecture—3 hours; computer workshop—3 hours. Prerequisite: Computer Science Engineering 30 or 35. Introduction to computer architecture; machine language; assembly language; macros and conditional

macros; subroutine/ parameter passing; input/output programming, interrupt and trap; direct-memory access; absolute and relocatable code; re-entrant code; program development in an operating system.

89A-U. Special Topics in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Chairperson in charge)

Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science, (B) Programming Systems, (C) Digital Systems, (D) Communications, (E) Signal Transmission, (F) Digital Communication, (G) Control Systems, (H) Robotics, (I) Signal Processing, (J) Image Processing, (K) High-Frequency Phenomena and Devices, (L) Solid-State Devices and Physical Electronics, (M) Systems Theory, (N) Active and Passive Circuits, (O) Integrated Circuits, (P) Computer Software, (Q) Computer Engineering, (R) Microprocessing, (S) Electronics, (T) Electromagnetics, (U) Opto-Electronics. May be repeated for credit when the topic is different.

92. Internship in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Chairperson in charge)

Internship—3-15 hours. Prerequisite: lower division standing; project approval prior to period of internship. Supervised work experience in Electrical and Computer Engineering. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses

100. Circuits II (5) I, II. The Staff

Lecture—3 hours; laboratory—3 hours; discussion—1 hour. Prerequisite: Engineering 17. Introduction to the theory and application of analog circuits. Students who have completed Engineering 100 may receive only 3.5 units of credit.

106. Introduction to Image Processing and Computer Vision (4) I. Reed, Ford, Algazi, Levy

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 150B. Imaging geometry; transforms and sampling; enhancement, restoration, and conversion; image compression; time-varying image analysis; elementary pattern recognition; segmentation; multi-resolution analysis.

110A. Electronic Circuits I (4) II, III. Spencer, Haley, Hurst, Lewis

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 17, courses 100 and 140A, course 180A (may be taken concurrently). Applications of operational amplifiers, modeling of active devices, design of small-signal linear amplifiers, design of basic logic gates.

110B. Electronic Circuits II (4) III. Spencer, Haley, Hurst, Lewis

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110A. Analysis and design of amplifier output stages, analysis of frequency response of amplifiers, analysis and design of multistage and feedback amplifiers, stability and compensation of feedback systems, oscillators, introduction to analog-to-digital and digital-to-analog converters.

111A. Electronic Circuits Laboratory (2) II.

Spencer, Hurst, Lewis, Current
Lecture/discussion—1 hour; laboratory—3 hours. Prerequisite: courses 100, 140A, 150A; course 110A (concurrently recommended); course 140B recommended (may be taken concurrently.) Laboratory measurement techniques. Spectral analysis. Transistor model parameter value extraction. Transistor amplifier design.

111B. Electronic Circuits Laboratory (2) III.

Spencer, Hurst, Lewis, Current
Lecture/discussion—1 hour; laboratory—3 hours. Prerequisite: courses 110A, 111A, 150A; course 110B (concurrently recommended); course 140B recommended. Design, analysis, and evaluation of logic circuits, multi-stage and feedback amps, and oscillators.

114. Analog Integrated Circuits (3) I. Hurst, Spencer, Current, Lewis

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 110B, 111B, 140B. Analysis and design of analog integrated circuits. Emphasis is on bipolar transistor circuits. Single-stage amplifiers, cascaded amplifier stages, current sources, differential pair, frequency response, and feedback amplifiers. (Former course 114A.)

118. Digital Integrated Circuits (3) III. Hurst, Current, Oklobdzija

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110B, 111B, 140B. Analysis and design of digital integrated circuits. Emphasis is on MOS logic circuit families. Logic gate construction, voltage transfer characteristics, and propagation delay. Regenerative circuits, RAMs, ROMs, and PLAs. (Former course 114B.)

130A. Introductory Electromagnetics I (4) I, II.

Dienes, Fink, Heritage, Knoesen
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 21D, 22B, Physics 9C, Engineering 17. Basics of static electric and magnetic fields and fields in materials. Work and scalar potential. Maxwell's equations in integral and differential form. Plane waves in lossless media. Lossless transmission lines.

130B. Introductory Electromagnetics II (4) II, III.

Dienes, Fink, Heritage, Knoesen
Lecture—3 hours; discussion—1 hour. Prerequisite: course 130A. Plane wave propagation in lossy media, reflections, guided waves, simple modulated waves and dispersion, and basic antennas.

131A. Electromagnetic Fields and Waves (3) I.

Dienes, Fink, Knoesen
Lecture—3 hours. Prerequisite: course 130B or the equivalent. Propagation and reflection of plane waves in isotropic media. Guided electromagnetic waves. Rectangular and circular wave guides.

131B. Electromagnetic Fields and Waves (3) II.

Fink, Dienes
Lecture—3 hours. Prerequisite: course 131A or the equivalent. Fiber optics. Helix and slow-wave structures. Wave propagation in media with anisotropic permittivity and permeability, and on plasmas. Travelling wave amplifier.

131C. Electromagnetic Fields and Waves (3) III.

Fink, Dienes
Lecture—3 hours. Prerequisite: course 131B or the equivalent. Resonant cavities; microwave networks and components; antennas.

132A. High-Frequency Systems, Circuits and Devices (4) I. Branner

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 130B. Application of electromagnetic theory to analysis and design of practical devices, circuits and systems operating at radio frequencies. Energy transfer at high frequencies, transmission lines, microwave integrated circuits, circuit analysis of electromagnetic energy transfer systems, the scattering parameters.

132B. High-Frequency Systems, Circuits and Devices (5) II. Branner

Lecture—3 hours; laboratory—3 hours; discussion—1 hour. Prerequisite: course 132A. Passive high frequency device analysis, design. Microwave circuit and filter design. Introduction to analysis and design of microwave transistor and tunnel diode amplifiers.

132C. RF Amplifiers, Oscillators, Mixers and Antennas (5) III. Branner

Lecture—3 hours; laboratory—3 hours; discussion—1 hour. Prerequisite: course 132B. Microwave amplifier theory and design, including transistor circuit models, stability considerations, noise models and low noise design. Theory and design of microwave transistor oscillators and mixers. Analysis and design of linear, loop, waveguide and horn radiators.

135. Optical Communications I: Fibers (3) II.

Dienes, Knoesen
Lecture—3 hours. Prerequisite: course 130B. Principles of optical communication systems. Dispersion broadening of pulses. Planar dielectric guides. Optical fibers: single-mode, multi-mode, step and graded

index. Attenuation and dispersion limitations. Design of zero dispersion fibers. Offered in alternate years.

140A. Principles of Device Physics I (4) I, II.

Bower, Churchill, Haley, Hunt, Smith
Lecture—3 hours; discussion—1 hour. Prerequisite: Physics 9C. Semiconductor device fundamentals, equilibrium and non-equilibrium statistical mechanics, conductivity, diffusion, density of states, electrons and holes, p-n junctions, Schottky junctions, and junction field effect transistors.

140B. Principles of Device Physics II (4) II, III.

Bower, Churchill, Haley, Hunt, Smith
Lecture—3 hours; discussion—1 hour. Prerequisite: course 140A. Electrical properties, design, and models for Bipolar and MOS devices.

145A. Solid-State Electronics (3) III. Bower, Churchill, Haley, Hunt

Lecture—3 hours. Prerequisite: course 140B. Semiconductor device physics, the principal techniques employed in creating device structures, materials for thin film devices, and heterostructure devices.

145B. Solid-State Electronics (3) I. Fink, Haley

Lecture—3 hours. Prerequisite: course 140A. Magnetism and superconductivity. Design of devices and their associated circuits utilizing the magnetic and superconducting properties of solids. Magnetic devices studied include masers and magnetic media: disk, tape and bubbles. Superconducting devices studied include Josephson junctions, SQUIDS, and SC microcircuits.

146A. Integrated Circuits Fabrication (3) II. Hunt, Bower

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 140B. Basic fabrication processes for metal oxide semiconductor (MOS) integrated circuits. Laboratory assignments covering oxidation, photolithography, impurity diffusion, metallization, wet chemical etching, and characterization work together in producing metal-gate PMOS test chips which will undergo parametric and functional testing. (Formerly course 115A.)

146B. Advanced Integrated Circuits Fabrication

(3) III. Hunt, Bower
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 146A. Fabrication processes for CMOS VLSI. Lab projects examine deposition of thin films, ion implantation, process simulation, anisotropic plasma etching, sputter metallization, and C-V analysis. Topics include isolation, projection alignment, epilayer growth, thin gate oxidation, and rapid thermal annealing. (Former course 115B.)

148. Superconductivity (3) III. Fink

Lecture—3 hours. Prerequisite: course 130A and 140A. Fundamental properties of superconductors of the first and second kind, London and Ginzburg-Landau theories, Josephson effects, applications and devices.

150A. Introduction to Signals and Systems I (4) II, III. Abdel-Ghaffar, Chang, Ford, Levy

Lecture—4 hours. Prerequisite: Engineering 17. Characterization and analysis of continuous-time linear systems. Fourier series and transforms with applications. Introduction to communication systems. Transfer functions and block diagrams. Elements of feedback systems. Stability of linear systems. (Not open to students who have taken Electrical and Computer Engineering 112.)

150B. Introduction to Signals and Systems II (4)

I, III. Hsia, Ford, Friedlander, Mayne, Wang
Lecture—3 hours; discussion—1 hour. Prerequisite: course 150A. Characterization and analysis of discrete time systems. Difference equation models. Z-transform analysis methods. Discrete and fast Fourier transforms. Introduction to digital filter design. (Not open to students who have taken Electrical and Computer Engineering 151.)

157A. Control Systems (4) I, II. Dorf, Gundes, Mayne, Wang, Chang

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 150A. Analysis and design of feedback control systems. Examples are drawn from electrical and mechanical systems as well as other engineering

fields. Mathematical modeling of systems, stability criteria, root-locus and frequency domain design methods.

157B. Control Systems (3) III. Hsia, Dorf
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 157A. Control system optimization and compensation techniques, digital control theory. Laboratory includes Servo system experiments and computer simulation studies.

160. Signal Analysis and Communications (4) I, III. Algazi, Feher, Ford, Friedlander, Gardner, Levy
Lecture—3 hours; discussion—1 hour. Prerequisite: course 112. Signal analysis based on Fourier methods. Fourier series and transforms; time-sampling, convolution, and filtering; spectral density; modulation: carrier-amplitude, carrier-frequency, and pulse-amplitude.

165. Modulation, Coding, and Noise (3) II. Algazi, Gardner, Levy
Lecture—3 hours. Prerequisite: course 160; Statistics 120. Introduction to random process models of modulated signals and noise, and analysis of receiver performance. Analog, carrier, and digital pulse modulation. Signal-to-noise ratio, probability of error, matched filters, and Wiener filters. Introduction to information theory and coding.

166. Digital Communication Design Techniques (4) II. Feher
Lecture—3 hours; discussion—1 hour. Prerequisite: course 160. Baseband digital signal processing for digital MODEMS (modulators-demodulators). Digital modulation techniques including BPSK, QPSK, MSK and QAM. Spread spectrum, TDMA and FDMA access methods. Satellite, cellular-mobile, microwave and personal communications systems (PCS) applications. Computer-aided and hardware design projects.

***167. Telecommunications Measurements and Instrumentation** (3) II. Feher
Lecture—3 hours. Prerequisite: course 160. Measurement techniques; instrumentation. Analysis of bit error rate, eye and constellation diagrams; noise and jitter measurement in digital communication and signal processing systems. Spectral and time measurements in digitized PCM voice and video, cellular digital mobile systems. Expert (artificial intelligence) applications. In-class experiments/ demonstrations.

170. Introduction to Computer Architecture (4) I, III. Oklobdzija, Redinbo, Wilken, Akella
Lecture—3 hours; discussion—1 hour. Prerequisite: course 70 or Computer Science Engineering 50; course 180A. Study of interrelationship and interaction of various parts of computer systems including instruction sets, processing and control units, particularly microprogrammed control units, buses, input-output, arithmetic and logic processing, and memory system hierarchies. (Not open to students who have taken Electrical and Computer Engineering 171.)

172. Microcomputer-Based System Design (4) I, II. Chang, Oklobdzija, Akella, Redinbo, Wilken
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 70 or Computer Science Engineering 50, and course 180A; course 180B concurrently recommended. Review of 8086/8088 microprocessor architecture; bus-based system architecture; peripheral chips architecture; I/O interface design; software I/O device drivers; interrupt driven system design; MS-DOS operating system based system design; real-time embedded system design.

173. Applications of Object-Oriented Programming (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Computer Science Engineering 30 or 35, and course 70 or Computer Science Engineering 50. Introduction to the modern programming paradigms of data abstraction and object-oriented programming for engineering applications such as robotics, image processing, etc. Introduction to object-oriented programming in C++ language. The techniques of partitioning an application into pieces by defining new types that match the concept of the application. (Not open to students who have taken Electrical and Computer Engineering 185.)

174. Microprocessor-Based Instrumentation Systems (4) III. Soderstrand
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 70 or Computer Science Engineering 50, and course 180A or Engineering 100. Typical uses of microprocessors and microprocessor development systems in instrumentation applications. Analytical and design methods common to modern instrumentation systems including: transducers, dynamic response, signal conditioning, A/D conversion, data transmission, hardware interfacing, software development, noise and safety. (Not open to students who have taken Electrical and Computer Engineering 150.)

180A. Digital Systems I (5) II, III. Oklobdzija, Redinbo, Wilken, Akella, Hakimi
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 100 or Engineering 100. Introduction to digital system design including combinational logic design, sequential and asynchronous circuits, computer arithmetic, memory systems and algorithmic state machine design; computer-aided design (CAD) methodologies and tools. (Not open to students who have taken Electrical and Computer Engineering 176.)

180B. Digital Systems II (5) I, III. Oklobdzija, Redinbo, Wilken, Akella
Lecture—3 hours; laboratory—6 hours. Prerequisite: courses 110A and 180A. Multi-input/output sequential digital systems; timing/pulse circuits: TTL, CMOS, ECL logic elements; analog switch; sample/hold; A-D-A converter design; system noise: grounding, shielding, cross-talk; reflection; memory systems; CAD with PLD/PAL; CAD with Xilinx FPGA. (Not open to students who have taken Electrical and Computer Engineering 177.)

189A-U. Special Topics in Electrical Engineering and Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science; (B) Programming Systems; (C) Digital Systems; (D) Communications; (E) Signal Transmission; (F) Digital Communication; (G) Control Systems; (H) Robotics; (I) Signal Processing; (J) Image Processing; (K) High-Frequency Phenomena and Devices; (L) Solid-State Devices and Physical Electronics; (M) Systems Theory; (N) Active and Passive Circuits; (O) Integrated Circuits; (P) Computer Software; (Q) Computer Engineering; (R) Microprocessing; (S) Electronics; (T) Electromagnetics; (U) Opto-Electronics. May be repeated for credit when topic is different.

190C. Research Group Conferences in Electrical and Computer Engineering (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: upper division standing in Electrical and Computer Engineering; consent of instructor. Research group conferences. May be repeated for credit. (P/NP grading only.)

192. Internship in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Internship—3-15 hours. Prerequisite: completion of a minimum of 84 units; project approval prior to period of internship. Supervised work experience in electrical and computer engineering. May be repeated for credit. (P/NP grading only.)

194A-194B-194C. Micromouse Design Project (2-1-1) I-II-III. Soderstrand
Laboratory—3 hours; discussion—1 hour (194A only). Prerequisite: course 70 or Computer Science Engineering 50; course 100 or Engineering 100 (may be taken concurrently); course 180A (may be taken concurrently). Design of a robotic mouse for the IEEE Micromouse competition. Course offering subject to student demand and availability of resources. Limited enrollment. May be repeated once for credit. (P/NP grading only; Deferred grading only, pending completion of three-course sequence.)

195A-195B. Student Design Project (2-2) II-III. The Staff
Laboratory—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Design projects and/or contests sponsored by industry. Topics vary; check with department for availability. Course offering subject to

student demand/availability of resources. May be repeated once for credit. Limited enrollment. (P/NP grading only. Deferred grading only, pending completion of sequence.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201. Digital Processing of Signals (4) II. Algazi, Friedlander, Ford
Lecture—4 hours. Prerequisite: course 150B. Theory and applications of digital processing of signals. Z-transform analysis of discrete-time systems, filter design techniques, structures for discrete-time systems, discrete Fourier transform, and Hilbert transforms.

***205. Introduction to Optical Information Processing** (3) II. Knoesen
Lecture—3 hours. Prerequisite: courses 230 and 250 recommended. Review of the scalar theory of diffraction and of two-dimensional Fourier transforms, from which the foundations of the frequency analysis of imaging systems will be developed. Image processing techniques will be examined, including the theory and applications of holography. Introduction to optical computing. Offered in alternate years.

206. Digital Image Processing (4) II. Algazi, Levy, Reed
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 150B. Two-dimensional systems theory, image perception, sampling and quantization, transform theory and applications, enhancement, filtering and restoration, image analysis, and image processing systems.

207. Pattern Recognition and Classification (3) III. Ford, Reed
Lecture—3 hours. Prerequisite: Statistics 120. Topics in statistical pattern recognition and classification: linear decision functions and minimum distance classification, Bayes decision theory, clustering algorithms, the generalized perceptron, multi-layer neural networks, and feature extraction.

208. Image Analysis and Computer Vision (3) III. Algazi, Levy
Lecture—3 hours. Prerequisite: course 150B. Geometry of two-dimensional objects. Edge detection and image segmentation. Image formation and fundamental principles of computer vision. Recovery of three-dimensional structure from shading or stereo information. Analysis of motion and estimation of motion parameters. Geometry and representation of three-dimensional objects.

209. Image Sequence Processing (3) III. Reed
Lecture—3 hours. Prerequisite: course 106. Basic video concepts and image sequences as spatiotemporal data; three-dimensional linear systems; perception of visual motion; enhancement of image sequences; image sequence representation; resolution issues; the computation of motion; image sequence compression.

210. Analog Circuit Design (3) I. Spencer, Current, Hurst, Lewis
Lecture—3 hours. Prerequisite: courses 110A-110B, 111A-111B, and 140B. Analysis and design of amplifiers, bias circuits, voltage references and other analog circuits. Feedback and compensation of linear amplifiers. Computer-aided analysis is used extensively.

***211. Advanced Analog Circuit Design** (3) II. Spencer, Current, Hurst
Lecture—3 hours. Prerequisite: course 210; Statistics 131A or the equivalent recommended. Noise in electronic circuits and systems. Distortion analysis; the translinear principle and its application to circuit analysis and synthesis; phase-locked loops and their applications.

212. Analog MOS IC Design (3) II. Hurst, Lewis
Lecture—3 hours. Prerequisite: course 210. Analysis and design of analog MOS integrated circuits. Pas-

sive components, single-ended and fully differential op amps, sampled-data and continuous-time filters.

213. Data-Conversion Techniques and Circuits (3) III. Lewis, Current, Hurst, Spencer

Lecture—3 hours. Prerequisite: course 210. Digital-to-analog and analog-to-digital conversion; component characteristics and matching; sample-and-hold, comparator, amplifier, and reference circuits.

***214A. Computer-Aided Circuit Analysis and Design (3)** I. Haley, Current

Lecture—3 hours. Prerequisite: courses 110A-110B, 111A-111B; knowledge of FORTRAN or C. Network equation formulations; nonlinear dc and linear ac circuit analysis. Calculation of dc and ac network sensitivities. Extensive computer project.

***214B. Computer-Aided Circuit Analysis and Design (3)** II. Current, Haley

Lecture—3 hours. Prerequisite: course 214A. Transient (time-domain) analysis; harmonic analysis; steady-state analysis; time-domain network sensitivities, ac, dc, transient gradient calculations, design optimization. Extensive computer project.

218A. Introduction to VLSI Circuits (3) I. Current, Hurst, Oklobdzija, Spencer

Lecture—3 hours. Prerequisite: courses 110A-110B, 111A-111B. Theory and practice of VLSI circuit and system design. Extensive use of VLSI computer-aided design aids allows students to undertake a VLSI design example.

218B. Multiproject Chip Design (1) II. Current, Hurst, Oklobdzija, Spencer

Laboratory—3 hours. Prerequisite: course 218A. CMOS and NMOS multiproject chip layouts of projects begun in courses 218A, 212, and 219 are assembled and submitted to the DARPA/NSF MOSIS program for fabrication.

218C. IC Testing and Evaluation (1) III. Current, Hurst, Oklobdzija, Spencer

Laboratory—3 hours. Prerequisite: course 218A and 218B. Chips submitted in course 218B are tested and evaluated. Issues involving design of ICs for testability are discussed.

219. Advanced Digital Circuit Design (3) III. Hurst, Current, Spencer

Lecture—3 hours. Prerequisite: course 118 or 218A. Analysis and design of digital circuits. Both bipolar and MOS circuits are covered. Dynamic and static RAM cells and sense amplifiers. Advanced MOS families. Multivalued logic.

***221. Passive Filter Design (3)** I. Soderstrand

Lecture—3 hours. Prerequisite: courses 100 and 150A. Introduction to the design of passive filters with lumped and distributed elements. Filter specification and design process, approximation theory, modern doubly terminated reactance, two-port synthesis, passive filters with lumped elements, crystal and ceramic filters, mechanical filters.

***222. Active Filter Design (3)** II. Soderstrand, Current, Haley

Lecture—3 hours. Prerequisite: course 221 recommended. Introduction to the design of active filters with lumped elements and switches. Active filters with lumped RC elements, active-R networks, and switched capacitor filters.

226A. Lasers (3) II. Dienes, Heritage

Lecture—3 hours. Prerequisite: course 130B or the equivalent, and course 231. Theoretical and practical description of lasers. Theory of population inversion, amplification and oscillation using semiclassical oscillator model and rate equations. Description and design of real laser systems. Offered in alternate years.

***226B. Advanced Lasers (3)** II. Dienes, Heritage

Lecture—3 hours. Prerequisite: course 226A. Quantum mechanical description of lasers and interactions of materials with laser light. Relationship to rate equation approach. Optical Bloch equations and coherent effects. Theory and practice of active and passive mode-locking of lasers. Injection locking. Offered in alternate years.

***227A. Microwave Electronics (3)** I. The Staff

Lecture—3 hours. Prerequisite: courses 130B and

140B. Theory of microwaves, waveguides and cavities. Interaction between electromagnetic fields and the electron charge. Lorentz force law, energy levels in matter and Zeeman splitting. Comparison between conventional and microwave tubes and other new types of microwave oscillators and amplifiers. Offered in alternate years.

***227B. Microwave Electronics (3)** II. The Staff

Lecture—3 hours. Prerequisite: course 227A or the equivalent. Theory of interaction between electromagnetic fields and electronic charge, with applications to electron beam and solid-state devices. Beam formation, velocity and density modulation, plasma oscillation, space charge wave propagation in klystrons. Parametric amplifiers, tunnel and IMPATT diodes, Gunn oscillators. Offered in alternate years.

228. Advanced Microwave and Antenna Design Techniques (3) II. Branner

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 132B or 131B, 221. Design, fabrication, analysis of advanced microwave devices, antennas. Includes FET amplifiers, broadband microstrip and stripline filters, hybrids, beamformers, tapered networks. Youla's broadband matching theory applied to microwave devices. Antenna design, analysis of horns, microstrip, log periodic, arrays, spirals and reflectors. Offered in alternate years.

230. Electromagnetics (3) I. Dienes, Fink

Lecture—3 hours. Prerequisite: course 130B. Maxwell's equations, plane waves, reflection and refraction, waveguides, waves in anisotropic media, propagation in dispersive media, laser beams and resonators.

231. Photonics (3) I. Dienes, Fink, Knoesen

Lecture—3 hours. Prerequisite: course 130B or the equivalent; course 230 recommended. Introduction to opto-electronics, including ray optics, wave optics, beam optics, resonators, couplers, pulse propagation in dispersive media, electro-optical modulation and detection. Offered in alternate years.

***232A. Advanced Applied Electromagnetics I (3)** II. Branner

Lecture—3 hours. Prerequisite: course 131B or 132B. The exact formulation of applied electromagnetic problems using Green's functions. Applications of these techniques to transmission circuits. Offered in alternate years.

***232B. Advanced Applied Electromagnetics II (4)** III. Branner

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 131B or 132B. Advanced treatment of electromagnetics with applications to passive microwave devices and antennas. Offered in alternate years.

***233. Nonlinear Optical Applications (3)** III. Knoesen, Dienes, Heritage

Lecture—3 hours. Prerequisite: course 130B or the equivalent; course 230 recommended. Nonlinear optical interactions have important applications in optical information processing, telecommunications and integrated optics. The basic concepts underlying optical nonlinear interactions in materials and in guided media are presented. Offered in alternate years.

240. Semiconductor Devices (3) II. Churchill, Bower, Hunt

Lecture—3 hours. Prerequisite: course 140B. Physical principles, characteristics and models of various semiconductor devices including: P-N junction and metal-insulator semiconductor diodes, junction and insulated gated field effect transistors. Not open for credit to students who have completed former course 220.

245A. Applied Solid-State Physics (3) II. Fink, Churchill, Haley, Hunt

Lecture—3 hours. Prerequisite: course 140B, Physics 115A. Physics of solids relevant to solid-state applications. Topics include atomic structure of solids, quantum theory of electronic and vibrational states in crystals, electron dynamics, and transport theory.

245B. Applied Solid-State Physics (3) III. Churchill, Hunt, Haley

Lecture—3 hours. Prerequisite: course 245A. Theory and application of magnetism and superconductivity.

Topics in magnetism include paramagnetism, ferromagnetism, magnetic resonance, and switching properties of magnetic elements. Topics in superconductivity include basic superconducting phenomena, Ginzburg-Landau theory, Josephson junctions, SQUIDS, and SC microcircuits.

***245C. Applied Solid-State Physics (3)** III. Haley, Heritage

Lecture—3 hours. Prerequisite: course 245A. The physics of solids and quantum-confined systems relevant to applications of fundamental optical processes. Topics include elementary excitations, radiative and non-radiative recombination, high-density excitation, stimulated emission, and excitonic effects in bulk material as well as quantum wells, wires, and boxes. Offered in alternate years.

246. Advanced Projects in IC Fabrication (3) I. Current, Hunt, Spencer, Smith

Discussion—1 hour; laboratory—6 hours. Prerequisite: course 146B. Individualized projects in the fabrication of analog or digital integrated circuits. (Former course 215.)

247. Advanced Semiconductor Devices (3) I. Churchill, Bower, Hunt

Lecture—3 hours. Prerequisite: course 240. Physics of various semiconductor devices, including metal-oxide-semiconductor field-effect transistors (MOS-FETs), IMPATT and related transit-time diodes, transferred-electron devices, light-emitting diodes, semiconductor lasers, photodetectors, and solar cells. Offered in alternate years.

***248. Microsensor Design and Fabrication (3)** III. Smith, Bower

Lecture—3 hours. Prerequisite: graduate standing in Engineering. Design and fabrication of sensors using microfabrication techniques. Topics include transduction principles, fabrication technologies specific to microsensors, and design of microsensor systems, including packaging. Offered in alternate years.

249. Microfabrication (3) III. Hunt

Lecture—3 hours. Prerequisite: graduate standing in Engineering. Theory and practices of several major technologies of microfabrication, used for producing integrated circuits, sensors, and microstructures. Major topics include sputtering, chemical vapor deposition, plasma processing, micromachining, and ion implantation. Offered in alternate years.

250. Linear Systems and Signals (4) I. Wang, Chang, Levy, Gundes

Lecture—4 hours. Prerequisite: course 150A. Review of linear algebra. Mathematical description of systems. Solution of the state equations and an analysis of controllability, observability, realizations, state feedback and state estimation. Introduction to discrete-time signals and system, and the Z-transform.

251. Nonlinear Systems (3) II. Gundes

Lecture—3 hours. Prerequisite: course 250. Nonlinear differential equations, second-order systems, approximation methods, Lyapunov stability, absolute stability, Popov criterion, circle criterion, feedback linearization techniques.

252. Multivariable Control System Design (3) III. Mayne, Wang

Lecture—3 hours. Prerequisite: course 250. Review of single-loop feedback design. Stability, performance and robustness of multivariable control systems. LQG design. H_{∞} design. Frequency response methods. Optimization-based design.

253. Adaptive Systems (3) I. Hsia

Lecture—3 hours. Prerequisite: course 150B; course 250 (may be taken concurrently.) Theory and practice of adaptive systems. Concepts of learning and adaptation. Structure of adaptive filters and the related parameter adaptive algorithms. Applications to system identification, adaptive signal processing and adaptive control.

255. Robotic Systems (3) I. Hsia, Wang

Lecture—3 hours. Introduction to robotic systems. Mechanical manipulators, kinematics, manipulator positioning and path planning. Dynamics of manipulators. Robot motion programming and control algorithm design.

***256. Multivariable Feedback Systems (3) III.**

Gundes

Lecture—3 hours. Prerequisite: course 250. Analysis and synthesis of feedback control systems using a factorization approach. Q-parameterization, all stabilizing controllers, all achievable input-output maps. Robustness, asymptotic tracking and disturbance rejection. Offered alternate years.

257. Topics in Optimization (3) III. Chang, Mayne
Lecture—3 hours. Prerequisite: graduate standing. Advanced topics in the theoretical foundations of optimization and its applications, such as: linear and nonlinear systems theory, stochastic programming, stochastic optimal control, approximation theory for optimization, advanced topics in numerical implementation of algorithms, shape optimization, large scale optimization, semi-infinite and nondifferentiable optimization with applications to engineering design, global optimizations. (Same course as Mathematics 257.)

***258A. Optimization I (3) II.** Chang, Mayne

Lecture—3 hours. Prerequisite: knowledge of FORTRAN or C. Modeling optimization problems existing in engineering design and other applications, optimality conditions, linear programming and unconstrained optimization (gradient, Newton, conjugate directions and minimax algorithms), convergence and rate of convergence, selected topics. (Same course as Mathematics 258A.)

***258B. Optimization II (3) III.** Chang, Mayne

Lecture—3 hours. Prerequisite: course 258A. Modeling constrained optimization problems existing in engineering design and other applications, optimality conditions, linearly and nonlinearly constrained optimization problems, projection, feasible directions and reduced gradient algorithms, interior point methods, Lagrangian theory, duality, augmented Lagrangians, sequential quadratic programming, selected topics. (Same course as Mathematics 258B.)

259. Optimal Control, Theory and Algorithms (3)

II. Chang, Mayne

Lecture—3 hours. Prerequisite: graduate standing. Optimal control and calculus of variations; existence of solutions to optimal control problem; necessary conditions of optimality, Pontryagin maximum principle, Euler equation; sufficient conditions of optimality, Hamilton-Jacobi-Bellman equation, linear quadratic regulator problem; algorithms for unconstrained and constrained optimal control problems. (Same course as Mathematics 259.)

260. Random Signals and Noise (4) II. Gardner

Lecture—3 hours; discussion—1 hour. Prerequisite: Statistics 120, course 150A; course 250 recommended. Random processes as probabilistic models for signals and noise. Review of probability, random variables, and expectation. Study of correlation function and spectral density, ergodicity and duality between time averages and expected values, filters and dynamical systems. Applications.

262. Spectral Analysis (4) II. Gardner

Lecture—3 hours; discussion—1 hour. Prerequisite: course 150A; course 150B recommended. Theory and methodology of empirical spectral analysis of random signals. Fundamentals of resolution, leakage, and reliability. Analog and digital methods. Parametric modeling and non-parametric methods. Cross-spectral analysis. Applications to detection and estimation.

263. Optimal and Adaptive Filtering (3) III. Friedlander, Gardner, Levy

Lecture—3 hours. Prerequisite: course 260. Geometric foundation for mean-square estimation problems. Theory and applications of optimum Wiener filtering, optimum Kalman filtering, and adaptive estimation.

264. Estimation and Detection of Signals in Noise (4) III. Friedlander, Gardner, Levy

Lecture—3 hours; discussion—1 hour. Prerequisite: course 260. Introduction to parameter estimation and detection of signals in noise. Bayes and Neyman-Pearson likelihood-ratio tests for signal detection. Maximum-likelihood parameter estimation. Detection of known and Gaussian signals in white or colored noise. Applications to communications, radar, signal processing.

266. Information Theory and Coding (3) II. Algazi,

Abdel-Ghaffar

Lecture—3 hours. Prerequisite: Statistics 120. Information theory and coding. Measure of information. Redundancy reduction encoding of an information source. Capacity of a communication channel, error-free communications.

267. Cellular Digital Mobile Communications (3) I. Feher

Lecture—3 hours. Prerequisite: courses 150A, 160, and Statistics 120 (or the equivalent). Wireless cellular, digital mobile and personal communication systems (PCS). Radio propagation, digital modulation and error control. Access methods: spread spectrum, FDMA and TDMA. Antenna diversity. Computer-aided system and hardware design.

268. Digital Modulation Techniques (3) III. Feher

Lecture—3 hours. Prerequisite: course 267. MODEM (modulator-demodulator) signal processing and complete radio transmitter/receiver analysis, design and application for digital cellular mobile radio satellite, microwave, and cable systems. Study of advanced $\pi/4$ -QPSK, GMSK, coded QAM and of correlative/coded modems. Computer-aided and hardware design of advanced communications and synchronization systems.

***269. Error Correcting Codes (3) II.** Abdel-Ghaffar

Lecture—3 hours. Prerequisite: Mathematics 22A. Introduction to coding theory, finite fields, linear codes, Hamming codes, cyclic codes, BCH and RS codes and their decoding algorithms, convolutional codes.

270. Computer Architecture (3) II. Redinbo,

Oklobdzija, Wilken

Lecture—3 hours. Prerequisite: course 170, 180A. Emphasis on quantitative analysis of design trade-offs, optimization of resource usage, formal descriptive models, and interactions between architecture and software.

***271. Advanced Digital System Design (4) II.**

Oklobdzija

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 170, 180B. Topics in advanced design of arithmetic processors. High-speed addition, multiplication, and division. Floating point processors. Pipeline processors. Laboratory involving design and construction of several example systems.

***273. Bit-Slice Microprogramming CISC and RISC Systems (3) II.**

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 172, 180B, 270. Microprogramming technique for the design of control unit of CPU for CISC (Complex Instruction Set Computer); microprogram control technique and state machine concept for digital logic design; hardware emulation of microprocessor, survey of RISC (Reduced Instruction Set Computer) based systems; hardware emulation of RISC-based systems. Offered in alternate years.

***274. Parallel Computer Architectures (3) II.**

Oklobdzija, Redinbo

Lecture—3 hours. Prerequisite: course 270. Use of parallelism to achieve high performance levels. Within-CPU parallelism, through pipelining. Multiple-CPU parallelism, through array processors and multiprocessors, and through novel structures such as dataflow machines. Current research.

276A. Introduction to Fault-Tolerant Computing (3) II. Wilken

Lecture—3 hours. Prerequisite: course 170, 180A. Introduces fault-tolerant computing theory and practice. Covers recent and classic fault-tolerant techniques based on hardware redundancy, time redundancy, information redundancy, and software redundancy. Examines hardware and software reliability analysis, and example fault-tolerant architectures. Offered in alternate years.

276B. Introduction to Digital Fault Diagnosis (3)

III. Redinbo

Lecture—3 hours. Prerequisite: course 180A; Statistics 120 or 131A. A review of several current techniques used to diagnose faults in both combinational and sequential circuits. Topics include path sensitization procedures, Boolean difference, D-algorithm

random test generation, TC testing and an analysis of the effects of intermittent faults. Offered in alternate years.

***277. Real-Time Multiprocessor/Multitasking System Design (5) III.** Oklobdzija

Lecture/discussion—2 hours; laboratory—9 hours. Prerequisite: courses 172, 180B, Computer Science Engineering 150. Real-time system design using multiple 16-bit microprocessors. System development and emulation through IBM/AT driven STD-bus system, and Intel's iRMX286 development system. Bus arbitration, design of basic real-time executive, and system design with iRMX289 real-time multitasking operating system. Offered in alternate years.

***278. Computer Arithmetic for Digital Implementation (3) III.** Oklobdzija, Redinbo

Lecture—3 hours. Prerequisite: course 170, 180A. The design and implementation of computer arithmetic logic units are studied with particular emphasis on high-speed performance requirements. Addition (subtraction), multiplication and division operations are covered, and fixed and floating-point representations are examined. Offered in alternate years.

***279. Artificial Neurons and Applications (4) I.**

Lecture—1.5 hours; discussion—1.5 hours; laboratory—3 hours. Prerequisites: courses 172, 180B, 207. Biological neuron, artificial neuron modelling and implementation, adaptive/learning algorithms, applications to pattern recognition. Offered in alternate years.

280. Advanced Logic Design (3) I. Oklobdzija

Lecture—3 hours. Prerequisite: course 180B. Logic design of complex and high-performance systems. Timing, clock generation and distribution. High performance latch design. Pipelining, pipeline conflicts and hazard resolution. Complex control unit design. Use of FPGAs. Design methodology and CAD tools.

289A-U. Special Topics in Electrical Engineering and Computer Science (1-5) I, II, III. The Staff

(Chairperson in charge)

Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science, (B) Programming Systems, (C) Digital Systems, (D) Communications, (E) Signal Transmission, (F) Digital Communication, (G) Control Systems, (H) Robotics, (I) Signal Processing, (J) Image Processing, (K) Advanced Theory and Design of GaAs FET Devices and Circuits at High Frequencies, (L) Solid-State Devices and Physical Electronics, (M) Systems Theory, (N) Active and Passive Circuits, (O) Integrated Circuits, (P) Computer Software, (Q) Computer Engineering, (R) Microprocessing, (S) Electronics, (T) Electromagnetics, (U) Opto-Electronics. May be repeated for credit when the topic is different.

290. Seminar (1) I. The Staff (Chairperson in charge)

Seminar—1 hour. Discussion and presentation of current research and development. (S/U grading only.)

290C. Graduate Research Group Conference in Electrical and Computer Engineering (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: consent of instructor. Research problems, progress, and techniques in electrical and computer engineering. May be repeated for credit. (S/U grading only.)

291. Solid-State Circuit Research Laboratory Seminar (1) III. The Staff (Spencer in charge)

Seminar—1 hour. Prerequisite: graduate standing. Lectures on solid-state circuit and system design by various visiting experts in the field. (S/U grading only.)

292. Seminar in Solid-State Technology (1) III. The Staff (Churchill in charge)

Seminar—1 hour. Prerequisite: graduate standing. Lectures on solid-state technology by various visiting experts in the field. (S/U grading only.)

294. Image, Video, and Computer Vision Research Seminar (1) II, III. Algazi

Seminar—1 hour. Prerequisite: graduate standing. Lectures, tutorials, and seminars on image processing, video engineering, and computer vision. (S/U grading only.)

295A. Robotics Research Seminar (1) II. The Staff (Hsia in charge)
Seminar—1 hour. Prerequisite: graduate standing. Technical presentations and lectures on current topics of robotics research and robotics technology. (S/U grading only.)

295B. Systems and Control Seminar (1) II, III. The Staff (Gundes in charge)
Seminar—1 hour. Prerequisite: graduate standing. Seminars on current research in systems and control by faculty and visiting experts. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

390. The Teaching of Electrical Engineering (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in Electrical Engineering. Participation as a teaching assistant or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated for credit. (S/U grading only.)

Engineering: Mechanical and Aeronautical

(College of Engineering)

Allan A. McKillop, Ph.D., Chairperson of the Department

Ronald A. Hess, Ph.D., Vice Chairperson of the Department

Department Office, 2132 Bainer Hall (916-752-0580)

Faculty

Ralph C. Aldredge, III, Ph.D., Assistant Professor
James W. Baughn, Ph.D., Professor (*Aeronautical Science and Engineering*)

Harry Brandt, Ph.D., Professor

John W. Brewer, Ph.D., Professor

Vincent R. Capece, Ph.D., Assistant Professor

Jean-Jacques Chattot, Ph.D., Professor

Harry H. Cheng, Ph.D., Assistant Professor

Harry A. Dwyer, Ph.D., Professor (*Aeronautical Science and Engineering*)

Fidelis O. Eke, Ph.D., Assistant Professor

Andrew A. Frank, Ph.D., Professor

Mohamed M. Hafez, Ph.D., Professor (*Aeronautical Science and Engineering*)

Jerald M. Henderson, D.Eng., Professor

(*Food Science and Technology*)

Ronald A. Hess, Ph.D., Professor (*Aeronautical Science and Engineering*)

Myron A. Hoffman, Sc.D., Professor

Mont Hubbard, Ph.D., Professor (*Aeronautical Science and Engineering*)

Maurly L. Hull, Ph.D., Professor

Dean C. Kamopp, Ph.D., Professor

Ian M. Kennedy, Ph.D., Professor

Wolfgang Kollmann, Dr.-Ing, Professor (*Aeronautical Science and Engineering*)

Donald L. Margolis, Ph.D., Professor

Allan A. McKillop, Ph.D., Professor

Bahram Ravani, Ph.D., Professor

Lawrence W. Rehfield, Ph.D. Professor (*Aeronautical Science and Engineering*)

Nesrin Sarigul-Klijn, Ph.D., Associate Professor

(*Aeronautical Science and Engineering*)

Benjamin D. Shaw, Ph.D., Assistant Professor

S. Antony Snell, Ph.D., Assistant Professor (*Aeronautical Science and Engineering*)

Cornelis P. van Dam, Ph.D., Associate Professor

(*Aeronautical Science and Engineering*)

Bruce R. White, Ph.D., Professor

(*Aeronautical Science and Engineering*)

Kazuo Yamazaki, Ph.D., Professor

(*Aeronautical Science and Engineering*)

Steven A. Velinsky, Ph.D., Associate Professor

Bruce R. White, Ph.D., Professor (*Aeronautical Science and Engineering*)

Kazuo Yamazaki, Ph.D., Professor

Emeriti Faculty

Charles W. Beadle, Ph.D., Professor Emeritus

Clyne F. Garland, M.S., Professor Emeritus

Warren H. Giedt, Ph.D., Professor Emeritus

John D. Kemper, Ph.D., Professor Emeritus

An Tzu Yang, D.E.Sc., Professor Emeritus

Division of Aeronautical Science and Engineering

Faculty

James W. Baughn, Ph.D., Professor

Jean-Jacques Chattot, Ph.D., Professor

Harry A. Dwyer, Ph.D., Professor (*Mechanical Engineering*)

Mohamed M. Hafez, Ph.D., Professor

Leonard R. Herrmann, Ph.D., Professor (*Civil and Environmental Engineering*)

Ronald A. Hess, Ph.D., Professor (*Mechanical Engineering*)

Myron A. Hoffman, Sc.D., Professor (*Mechanical Engineering*)

Mont Hubbard, Ph.D., Professor (*Mechanical Engineering*)

Wolfgang Kollmann, Dr.-Ing, Professor (*Mechanical Engineering*)

Lawrence W. Rehfield, Ph.D. Professor

Nesrin Sarigul-Klijn, Ph.D., Associate Professor

S. Antony Snell, Ph.D., Assistant Professor

(*Mechanical Engineering*)

Cornelis P. van Dam, Ph.D., Associate Professor

Bruce R. White, Ph.D. Professor

(*Mechanical Engineering*)

Emeriti Faculty

James A. Cheney, Ph.D., Professor Emeritus

Courses in Engineering: Mechanical (EME)

(Courses in Mechanical Engineering (EME) are listed below; courses in Aeronautical Science and Engineering (EAE) are listed immediately following.)

Lower Division Courses

1. Mechanical Engineering (1) I. The Staff (Chairperson in charge)

Lecture—1 hour. Description of the field of mechanical engineering with examples taken from industrial applications; discussion of the practice with respect to engineering principles, ethics and responsibilities. (P/NP grading only.)

50. Manufacturing Processes (3) I, II, III.

The Staff

Discussion—2 hours; laboratory—3 hours. Restricted to Mechanical, Aeronautical, and Materials Science Engineering majors. Introduction to and experience with modern manufacturing methods and computer-aided manufacturing and their roles in engineering design and development process.

92. Internship in Mechanical Engineering (1-5) I, II, III. The Staff (Chairperson in charge)

Internship. Prerequisite: lower division standing; approval of project prior to period of internship.

Supervised work experience in engineering. May be repeated for credit (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

134. Vehicle Stability (4) III. Margolis

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 102. Introduction to the static and dynamic stability characteristics of transportation vehicles with examples drawn from aircraft, high performance automobiles, rail cars and boats. Laboratory experiments illustrate the dynamic behavior of automobiles, race cars, airplanes, bicycles, etc.

150A. Mechanical Design (3) I, III. Hull, Velinsky

Lecture—2 hours; discussion—1 hour. Prerequisite: Engineering 45, 104B; course 50 (may be taken concurrently). Restricted to Mechanical, Aeronautical, and Materials Science majors; and Biological Systems and Food Engineering majors. The principles of engineering mechanics applied to fundamentals of mechanical design. Theories of static and fatigue failure of metals. Design projects emphasizing the progression from conceptualization to hardware.

150B. Mechanical Design (4) I, II. Frank, Velinsky

Lecture—3 hours; discussion—1 hour. Prerequisite: course 150A. Restricted to Aeronautical and Mechanical Engineering and Materials Science majors. Principles of engineering mechanics, failure theories and fatigue theory applied to design and selection of mechanical components. Design projects which concentrate on design, engineering analysis, methods of manufacture, material selection and cost. Introduction to computer-aided design.

151. Statistical Methods in Design and Manufacturing (3) II. Ravani

Lecture—3 hours. Prerequisite: course 150A. Methods of statistical analysis with emphasis on applications in mechanical design and manufacturing quality control. Applications include product evaluation and decision making, probabilistic design, methods of sampling inspections and control charts.

152. Computer-Aided Mechanism Design (3) I. Cheng

Lecture—2 hours; discussion—1 hour. Prerequisite: Engineering 5 or the equivalent or Engineering 36. Principles of computer-aided mechanism design. Computer-aided kinematic, static, and dynamic analysis and design of planar mechanisms such as multiple-loop linkages and geared linkages. Introduction to kinematic synthesis of mechanisms.

153. Introduction to Machining of Material (3) III. Yamazaki

Lecture—3 hours. Prerequisite: Engineering 36, 45, 104B, and course 50. Material removal characteristics, kinematics and dynamics of material removal processes such as metal cutting, grinding, non-traditional machining such as EDM and laser cutting, and quality in machining. The lecture is accompanied by live demonstration of the technology.

161. Combustion and the Environment (4) III. Kennedy

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B and 105B. Introduction to combustion kinetics; the theory of premixed flames and diffusion flames; turbulent combustion; formation of air pollutants in combustion systems; examples of combustion devices which include internal combustion engines, gas turbines, furnaces and waste incinerators; alternative fuel sources.

162. Modern Power Systems (4) II. Hoffman

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B. Study of modern powerplants for electric power generation and cogeneration. Thermodynamic analysis of different powerplant concepts using fossil fuels, nuclear fuels, solar energy, etc. Design studies of some specific powerplants.

165. Fundamentals of Heat Transfer (4) I, II. Dwyer, McKillop

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 5, 103B and 105B; restricted to Aeronautical and Mechanical Engineering and Materials Science majors and Biological Systems and Food Engineering majors. Fundamentals of conduction, convection and radiation heat transfer; applications to engineering equipment with use of digital computers.

171. Analysis, Simulation and Design of Dynamic Systems (4) I, II. Kamopp, Snell

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 102. Modeling of dynamic engineering systems in various energy domains. Analysis of response of linear system models. Digital computer simulation.

172. Automatic Control of Engineering Systems

(4) II, III. Snell, Eke
Lecture—3 hours; discussion—1 hour. Prerequisite: course 171. Classical feedback control for engineering systems. Control system design using time and frequency domain methods. State space techniques.

176. Measurement Systems (3) II, III. Velinsky, Snell
Lecture—2 hours; discussion—1 hour; laboratory—1 hour. Prerequisite: Engineering 100 and 36; restricted to Aeronautical and Mechanical Engineering and Materials Science students. Theory of measurements; measurement techniques for mechanical systems; transducers; data manipulation and processing; data digitization.

184A. Mechanical Engineering Design Project (2) I, II, III. The Staff
Laboratory—6 hours. Prerequisite: senior standing in Mechanical Engineering, consent of instructor (enrollment preference to students who have not taken any of course series, 184-188). Performance of a major design project which includes design and possible development and evaluation of mechanical engineering system.

184B. Mechanical Engineering Design Project (2) I, II, III. The Staff
Laboratory—6 hours. Prerequisite: course 184A in a previous quarter from the same instructor; consent of instructor. Performance of projects which include design and possible development and evaluation of a mechanical engineering system.

185. Mechanical Systems Design Projects (4) III. Henderson
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: senior standing in Mechanical Engineering (enrollment preference to students who have not taken any of course series, 184-188). Design of mechanical systems. Engineering case studies will help to illustrate the engineering design process and its use in design of engineering systems. Grading based on individual contributions to projects.

186. Thermal Systems Design Project (4) III. Aldredge
Lecture—3 hours; discussion—1 hour. Prerequisite: course 165; senior standing in Mechanical Engineering or Physics (enrollment preference to students who have not taken any of course series, 184-188). Design of a thermal system such as a power plant or engine, including consideration of engineering and economic factors. Grading based on individual contributions to project. Limited enrollment.

187. Control Systems Design Project (4) III. Frank
Lecture—3 hours; discussion—1 hour. Prerequisite: course 172; senior standing in Mechanical Engineering (enrollment preference to students who have not taken any of course series, 184-188). Design of dynamic engineering systems. Formulation of goals, mathematical modeling of plant, consideration of passive, open loop, and closed loop active solutions. Hardware and cost/performance considerations. Grading based on individual contributions to projects.

188. Vehicle Systems Design Project (4) II. Frank
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 150B; senior standing in Mechanical Engineering (enrollment preference to students who have not taken any of course series, 184-188). Design of vehicle systems, including components, and/or complete vehicles for groups or individuals. Students will design, analyze, construct and evaluate a vehicle-related component. Grading based on individual contributions to projects. Limited enrollment.

192. Internship in Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Internship. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work experience in mechanical engineering. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

205. Thermal Radiation (3) II. Brandt
Lecture—3 hours. Prerequisite: course 165 or consent of instructor. The transfer of radiant energy. Geometrical and spectral characteristics of systems involving thermal radiation. Gaseous radiation. Applications to solar energy systems. Offered in alternate years.

208A. Experimental Methods in the Thermal Sciences (3) I. Baughn
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: course 165. Experiment design, statistics uncertainty analysis. Steady-state and transient temperature measurement. Steady-state flow and pressure measurements. Offered in alternate years.

***208B. Experimental Methods in Fluid Mechanics and Combustion** (3) III. Kennedy
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 165 and Engineering 103B. Application of shadow, schlieren and other flow visualization methods. Introduction to optics and lasers. Measurement of velocity and concentrations in reacting and non-reacting flows with laser diagnostic techniques including LDV, Rayleigh, Raman and fluorescence scattering and CARS. Offered in alternate years.

210A. Advanced Fluid Mechanics and Heat Transfer (4) I. Shaw
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B, course 165. Development of differential equations governing continuity, momentum, and energy transfer. Solutions in laminar flow for exact cases, low and high Reynolds numbers and lubrication theory. Dynamics of inviscid flow.

210B. Advanced Fluid Mechanics and Heat Transfer (4) II. Kollmann
Lecture—3 hours; discussion—1 hour. Prerequisite: course 210A. Study of stability and transition to turbulence. Introduction to the physics of turbulence. Modeling of turbulence for numerical determination of momentum and heat transfer.

***211. Fluid Flow and Heat Transfer Design** (4) I. Hoffman
Lecture—3 hours; discussion—1 hour. Prerequisite: course 210A (may be taken concurrently) or consent of instructor. Design aspects of selected topics such as heat conduction, thermal stresses, fins; heat transport in ducts, boundary layers and separated flows; impingement and film cooling; heat exchangers; flow in diffusers, flow over airfoils and blades. Offered in alternate years.

212. Advanced Heat Transfer with Phase Change (4) III. Hoffman
Lecture—3 hours; discussion—1 hour. Prerequisite: course 165. Study of complex phenomena occurring in two-phase flow, boiling and condensation. Development of fundamental relations. Use of these relations with experimental data to develop semi-empirical working relations; application to various energy system and power-plant problems. Offered in alternate years.

***213. Advanced Turbulence Modeling** (4) III. Kollmann
Lecture—4 hours. Prerequisite: course 210B. Methods of analyzing turbulence; kinematics and dynamics of homogeneous turbulence; Reynolds stress and heat-flux equations; second order closures and their simplification; numerical methods; application to boundary layer-type flows; two-dimensional and three-dimensional hydraulic and environmental flows. Offered in alternate years.

214. Numerical Calculation of Flows with Heat Transfer, Mass Transfer, and Chemical Reactions (4) III. Dwyer
Lecture—3 hours; discussion—1 hour. Prerequisite: course 210A and Aeronautical Science Engineering 233, or consent of instructor. Application of numerical approximation methods of fluid flows involving heat and mass transfer for mechanical and aeronautical applications. Applications to pipe flows; high Peclet number heat transfer; laminar and turbulent combustion; and solution of the Navier-Stokes equations. Offered in alternate years.

216. Advanced Thermodynamics (4) I. Kennedy
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 105B. Study of topics important to energy conversion systems, propulsion and other systems using high temperature gases. Classical thermodynamics and quantum statistical mechanics of nonreacting and chemically reacting gases, gas mixtures, and other substances. Offered in alternate years.

217. Combustion (4) II. Aldredge
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B and 105B. Review of chemical thermodynamics and chemical kinetics. Discussions of reacting flows, their governing equations and transport phenomena; detonations; laminar flame structure and turbulent combustion.

218. Advanced Energy Systems (4) I. Hoffman
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B, or the equivalent. Review of options available for advanced power generation. Detailed study of basic power balances, component efficiencies, and overall powerplant performance for one advanced concept such as a fusion, magneto-hydrodynamic, or solar electric powerplant. Offered in alternate years.

220A-220B. Mechanical Vibrations (3-3) II-III. Karnopp
Lecture—3 hours. Prerequisite: Engineering 122. Applications of vibration theory to systems with many degrees of freedom and continuous systems. Introduction to random vibrations.

222. Advanced Dynamics (3) I. Karnopp
Lecture—3 hours. Prerequisite: Engineering 102. Dynamics of particles and of rigid bodies with advanced engineering applications; generalized coordinates; Hamilton's Principles; Lagrange's Equations; Hamilton-Jacobi theory.

***223A. Multibody Dynamics** (4) II. Hubbard
Lecture—3 hour; discussion—1 hour. Prerequisite: course 222 or consent of instructor. Dynamics of coupled rigid bodies; multibody kinematics; Euler and Tate-Bryan angles; constrained motion; nonholonomic systems; inertia dyadics; generalized active and inertia forces; Kane, Newton-Euler, and Lagrange formulations for multibody systems; computer-aided equation derivation.

***223B. Multibody Dynamics II** (4) III. Hubbard
Lecture—3 hour; discussion—1 hour. Prerequisite: course 223A. Advanced topics on the dynamics of coupled rigid bodies; multibody kinematics; multibody kinetics; extraction of information from dynamical equations; linearization stability of motion; numerical methods in dynamics; computer simulations.

224. Kinematic Design of Mechanisms (3) II. Cheng
Lecture—3 hours. Prerequisite: course 152 or consent of instructor. Introduction to Bernerster theory of the rational design of link mechanisms. Geometric concept of two- and three-dimensional rigid-body displacements, instantaneous invariants, higher order path curvature analysis, circle- and center-point curves. Graphic and computer methods for kinematic design. Offered in alternate years.

***225. Spatial Kinematics and Robotics** (3) II. The Staff
Lecture—3 hours. Prerequisite: course 222. Spatial kinematics: point and line coordinates and their transformations; concept of screw systems and instantaneous invariants for rigid body motion. Robotics: solving for kinematic equations; differential relationships; motion trajectories. Application of dual-number matrices, screw calculus, and associated analytical methods. Offered in alternate years.

***226. Acoustics and Noise Control** (3) I. Margolis
Lecture—3 hours. Prerequisite: Engineering 122. Description of sound using normal modes and waves; interaction between vibrating solids and sound fields; sound absorption in enclosed spaces; sound transmission through barriers; applications in design of mufflers, acoustic enclosures, room acoustics, design of quiet machinery. Offered in alternate years.

227. Research Techniques in Biomechanics (4) II. Williams, Hawkins

Lecture—2 hours; laboratory—4 hours; term paper/discussion—1 hour. Prerequisite: consent of instructor; Physical Education 115 recommended. Experimental techniques for biomechanical analysis of human movement are examined. Techniques evaluated include data acquisition and analysis by computer, force platform analysis, strength assessment, planar and three-dimensional videography, data reduction and smoothing, body segment parameter determination, electromyography, and biomechanical modelling. (Same course as Biomedical Engineering 227/Physical Education 227.)

231. Musculo-Skeletal System Biomechanics (3) III. Hull

Lecture—3 hours. Prerequisite: course 176 and Engineering 102. Mechanics of skeletal muscle and mechanical models of muscle, solution of the inverse dynamics problems, theoretical and experimental methods of kinematic and kinetic analysis, computation of intersegmental load and muscle forces, applications to gait analysis and sports biomechanics. Offered in alternate years. (Same course as Biomedical Engineering 231.)

232. Skeletal Tissue Mechanics (3) III. Martin
Lecture—3 hours; laboratory—1 hour. Prerequisite: Engineering 104B. Overview of the mechanical properties of the various tissues in the musculoskeletal system, the relationship of these properties to anatomic and histologic structure, and the changes in these properties caused by aging and disease. The tissues covered include bone, cartilage and synovial fluid, ligament and tendon. (Same course as Biomedical Engineering 232.)

234. Design and Dynamics of Road Vehicles (3) II. Velinsky

Lecture—3 hours. Prerequisite: course 134. Analysis and numerical simulation of road vehicles with emphasis on design applications. Offered in alternate years.

251. Mechatronics (4) III. Yamazaki

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 172. Studies of techniques required for designing the electromechanical system which consists of the mechanism and the electronics-based sophisticated control. Methodologies for designing the microprocessor applied control hardware and dedicated software, applying electric and dedicated software, and applying electric actuator and sensors with its theoretical background.

255. Computer-Aided Design and Manufacturing (3) III. Ravani

Lecture—2 hours; discussion—1 hour. Prerequisite: Engineering 180 and course 150B. Proficiency in a high-level programming language such as FORTRAN, Pascal, or C. Studies of computational and computer graphic techniques in design and manufacturing. Use of numeric and non-numeric computations and geometric tools in design and manufacturing.

270. Modeling and Simulation of Engineering Systems (3) I. Margolis

Lecture—3 hours. Prerequisite: course 172 or consent of instructor. Multiport models of mechanical, electrical, hydraulic and thermal devices; bond graphs, block diagrams and state space equations; Hamilton's principle for complex systems; formulation for analog and digital simulation; identification; instrumentation, approximate models of distributed systems.

271. Design of Multivariable Control Systems (3) II. Margolis

Lecture—3 hours. Prerequisite: course 270 or consent of instructor. Modern methods of state variable feedback applied to control system design. Introduction to observers and equivalent dynamic feedback. Stress on practical application of theory to engineering systems in various energy domains.

272A. Mathematical Foundations of System and Control Theory (4) I. Brewer

Lecture—4 hours. Prerequisite: course 172. Singularity functions, Laplace transforms, and Z-transforms. Algebra of groups and rings and of polynomials and matrices. Reducibility, controllability, and observabil-

ity. Observers and feedback control for single input, single output systems. Equal emphasis on frequency domain and state variable methods.

272B. Multivariable Feedback Control and Estimation Theory (4) II. Brewer

Lecture—4 hours. Prerequisite: course 272A. Emphasis on multi-input, multi-output systems. Digital and continuous time control and estimation. Introduction to singular value methods and quantitative feedback theory. Optimum Wiener-Hopf design and other frequency domain methods.

272C. Mathematical Foundations of Nonlinear Control Theory (4) III. Brewer

Lecture—4 hours. Prerequisite: course 272B. Emphasis on the mathematical analysis of feedback systems which contain a non-linear element. Poincare-Bendixon theory and limit cycles. Harmonic balance and describing functions. Chaos and strange attractors. Lie algebras and linearization.

274. Analysis and Design of Digital Control Systems (4) III. Hess

Lecture—3 hours; discussion—1 hour. Prerequisite: course 172. Discrete systems analysis; digital filtering; sample data systems; state space and transform design techniques; quantization effects.

276A. Digital Data Acquisition and Analysis (3) I. Gibeling

Lecture—2 hours; discussion—1 hour. Prerequisite: course 176. Application of microcomputers and mini-computers to data acquisition and control. Topics include computer organization, hardware for laboratory applications of computers, fundamentals of interfaces between computers and experimental equipment, programming techniques for data acquisition and control, and basic data analysis.

276B. Digital Data Acquisition and Analysis (3) III. Hull

Lecture—3 hours. Prerequisite: basic course in probability and statistics, Engineering 180 or the equivalent, and either course 176 or 172. Theory and application of modern techniques in digital data analysis. Topics include statistical description of data, convolution and correlation, and frequency analysis using the discrete Fourier transform. Emphasis on applying these techniques in the experimental characterization of linear dynamic systems. Offered in alternate years.

***277. Computer-Aided Design of Nonlinear Dynamic Systems (3) III.** The Staff

Lecture—2 hours; discussion—1 hour. Prerequisite: courses 270, 271. Application of bond graph modeling and control system design principles. The bond graph processor programs ENPORT and CAMP are used with advanced continuous system modeling programs to simulate the dynamic response of engineering systems.

280. Advanced Engineering Analysis (3) I. Brandt
Lecture—3 hours. Prerequisite: Engineering 180 or the equivalent. Applications in mechanical engineering of advanced analytical and numerical techniques. Topics include probability theory, calculus of variations, classification of differential equations, and advanced numerical methods.

290C. Graduate Research Conference (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: consent of instructor. Individual and/or group conference on problems, progress, and techniques in mechanical engineering research. May be repeated for credit. (S/U grading only.)

295. Design Seminar (1) I, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of current mechanical engineering design literature and projects with presentations by students and faculty. (S/U grading only.)

296. Fluid and Thermal Sciences Seminar (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of the current literature and trends in fluid mechanics and thermal sciences. (S/U grading only.)

297. Dynamic Systems and Control Theory

Seminar (1) I, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of current literature and developments in system theory and automatic control with presentations by individual students. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Professional Course

390. The Teaching of Mechanical Engineering (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in mechanical engineering. Participation as a teaching assistant or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated for credit. (S/U grading only.)

Courses in Aeronautical Science and Engineering (EAE)**Lower Division Course****25. Aeronautical Engineering Fundamentals (3) II.** Sarigul-Klijn

Lecture—3 hours. Prerequisite: Engineering 4 and Mathematics 21A. Restricted to Mechanical, Aeronautical, and Materials Engineering majors. History of aeronautics. Aircraft subsystems and nomenclature. Fundamentals of aircraft aerodynamics, performance, stability and control, structures and aeroelasticity, and propulsion. Not open for credit to students who have completed Aeronautical Science and Engineering 125.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor and lower division standing. (P/NP grading only.)

Upper Division Courses**126. Theoretical and Computational Aerodynamics (4) III.** Hafez

Lecture—3 hours; discussion—1 hour. Prerequisite: course 25; Engineering 103B; Engineering 180 or Applied Science Engineering 115 or Mathematics 128C. Development of general equations of fluid motion. Study of flow field kinematics and dynamics. Flow about a body. Thin airfoil theory. Viscous effects. Applications of numerical methods to wing analysis and design.

127. Applied Aircraft Aerodynamics (4) I. Chattot
Lecture—3 hours; discussion—1 hour. Prerequisite: course 126. Experimental characteristics of wing sections. High-lift devices. Lift and drag at high Mach numbers. Drag aerodynamics. Total aircraft drag estimation. Aerodynamic design procedures.

128. Aircraft Performance (4) II. van Dam
Lecture—3 hours; discussion—1 hour. Prerequisite: course 127. Aircraft propulsion systems and their performance characteristics. Methods for computing and presenting aircraft performance data. Modern techniques of numerical analysis and energy methods. Application of techniques to aircraft design.

129. Aircraft Stability and Control (4) II. Hess
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 102. Aircraft static stability and control. Derivation and linearization of general equations of motion for aircraft. Longitudinal dynamic stability analysis. Introduction to lateral-directional dynamic stability. Stability derivatives. Application of numerical methods to aircraft design.

130. Aircraft Preliminary Design (4) III. van Dam
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: courses 128 and 129. Aircraft preliminary design including estimation of weight/volume, aerodynamics, performance, stability and control. Design iteration and trade-off studies.

131. Aircraft Flight Performance Laboratory (3) III. Baughn

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: courses 25 and 128. Measurements and analysis of aircraft characteristics and performance, in flight and with flight simulator.

133. Introduction to Aerospace Structures (3) III. Sarigul-Klijn

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 104B. Open to Engineering students only. Introduction to the aerospace structural design process. History of aircraft materials. Details of aircraft structural components. Thin-walled structural members. Matrix methods of aerospace structural analysis. Application of finite element methods to aircraft and spacecraft structures.

135. Aerospace Structures (3) I. Rehfield

Lecture—3 hours. Prerequisite: course 133. Analysis and design methods used in aircraft structures. Shear flow in open, closed and multi-cell beam cross-sections, buckling of flat and curved sheets, tension field beams, local buckling.

137. Structural Composites (4) II. Rehfield

Lecture—3 hours; laboratory—1 hour. Prerequisite: Engineering 104B. Overview of materials and technology for creating structures from fiber reinforced resin matrix composite material systems. Elementary design analysis and case studies emphasizing aeronautical applications.

138A. Aircraft Propulsion (4) II. Capece

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 45, 103B, 105B. Analysis and design of modern aircraft gas turbine engines. Development and application of cycle performance prediction techniques for important engine configurations. Introduction to the operation and design of inlets, compressors, burners, turbines, and nozzles. Cycle design studies for specific applications.

139. Introduction to Aeroelasticity (4) III. Sarigul-Klijn

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 103B and 104B. Introduction to fluid-structure interaction. Flexible structures. Design of structural components under aeroelastic constraints. Static aeroelasticity. Control effectiveness. Unsteady aerodynamics. Flutter. Aeroelastic tailoring in design.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses***230. Advanced Aerodynamics-Inviscid Flow (4) II.** Hafez

Lecture—4 hours. Prerequisite: courses 126, 127. Inviscid theory. Nonlinear effects in subsonic and supersonic flows. Transonic aerodynamics. Offered in alternate years.

***232. Advanced Aerodynamics-Viscous Flow (4) I.** Dwyer

Lecture—4 hours. Prerequisite: Engineering 103B. Discussion of boundary-layer theory, laminar and turbulent boundary layers, laminar boundary-layer instability and transition, separation, viscous/inviscid interaction, three-dimensional flows and computational methods and their application. Offered in alternate years.

233. Introduction to Computational Aerodynamics and Fluid Dynamics (4) I. Chattot

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B. Introduction to numerical methods for solution of fluid flow problems. Discretization techniques and solution algorithms. Finite difference solutions to classical model equations pertinent to wave phenomena, diffusion phenomena, or equilibrium. Application to the incompressible Navier-Stokes equation.

234. Computational Aerodynamics (4) II. Hafez

Lecture—4 hours. Prerequisite: courses 230, 233. Numerical methods for aerodynamics flow simulation

in the transonic regime. Solutions of steady and unsteady potential and compressible boundary layer equations. Numerical schemes for mixed type equations and shock waves/numerical grid generation. Viscous/inviscid interaction and coupling procedures.

235. Computational Fluid Dynamics, Euler and Navier-Stokes Equations (4) III. Chattot

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 233 or consent of instructor. Euler and Navier-Stokes equations, conservative form, numerical methods for systems of convection and convection-diffusion equations, computation of compressible Euler and Navier-Stokes equations, generalized coordinates, grid generation, applications.

***236. Aerodynamics in Nature and Technology (4) III.** White

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B. Introduction to aerodynamics in nature, fundamentals of turbulence in atmospheric flows, planetary boundary layers, wind effects on man-made objects, pedestrian-level winds in urban areas. Criteria for laboratory modeling of atmospheric flows, wind-tunnel testing, extra-terrestrial aerodynamics. Offered in alternate years.

237. Analysis and Design of Composite Structures (4) III. Rehfield

Lecture—3 hours; discussion—1 hour. Prerequisite: course 137. Modeling and analysis methodology for composite structures including response and failure. Laminated plate bending theory. Introduction to failure processes.

238. Advanced Aerodynamic Design and Optimization (4) III. van Dam

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Application of aerodynamic theory to obtain optimum aerodynamic shapes. Both analytic solutions and solutions obtained with numerical optimization techniques will be examined. Includes introduction to the calculus of variations and numerical optimization techniques. Offered in alternate years.

239. Advanced Topics in Thermo-Structural Analysis and Thermo-Structural Dynamics (4) II. Sarigul-Klijn

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 180 or Applied Science Engineering 115 or Mathematics 128C. Thermal structures. Introduction to structural synthesis. Transient response of structures. Variational and energy methods. Finite and boundary elements. Special finite element formulations (transfinite elements, transition elements, etc.). Coupled heat transfer and structural analysis. Applications to mechanical, aeronautical, and civil structures. Offered in alternate years.

240. Computational Methods in Nonlinear Mechanics (4) II. Sarigul-Klijn

Lecture—4 hours. Prerequisite: Applied Science Engineering 115; Mathematics 128B. Deformation of solids and the motion of fluids are treated within the framework of the state-of-the-art computational methods. Numerical treatment of nonlinear dynamics; classification of coupled problems; vector computers with special applications to nonlinear mechanics. Offered in alternate years.

261. Gas Dynamics (4) III. Capece

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B or the equivalent. Flow of compressible fluids. Isentropic flow. Flow with friction, heat transfer, chemically reacting gas and particle mixtures. Normal and oblique shock waves, combustion, blast and expansion waves. Method of characteristics. Steady compressible boundary layer flow. Offered in alternate years.

***275. Advanced Topics in Aircraft Stability and Control (4) I.** Hess

Lecture—3 hours; discussion—1 hour. Prerequisite: Mechanical Engineering 172. Development of aircraft equations of motion; response to control actuation; response to random inputs-turbulence description; stability augmentation system design; pilot/vehicle analysis; handling qualities. Offered in alternate years.

290C. Graduate Research Conference (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: consent of instructor. Individual and/or group conference on problems, progress and techniques in mechanical engineering research. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)**299. Research (1-12) I, II, III.** The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

Professional Course**390. The Teaching of Aeronautical Science and Engineering (1) I, II, III.** The Staff

Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in Aeronautical Science and Engineering. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated for credit. (S/U grading only.)

English

(College of Letters and Science)

Karl F. Zender, Ph.D., Acting Chairperson of the Department

Department Office, 114 Sproul Hall, (916-752-2257)

Faculty

William E. Baker, Ph.D., Professor
 Max Byrd, Ph.D., Professor
 Caron A. Cioffi, Ph.D., Assistant Professor
 Peter A. Dale, Ph.D., Professor
 Sandra M. Gilbert, Ph.D., Professor
 John O. Hayden, Ph.D., Professor
 Peter L. Hays, Ph.D., Professor
 W. Jack Hicks, Ph.D., Associate Professor
 Michael J. Hoffman, Ph.D., Professor
 Michael P. Kramer, Ph.D., Associate Professor
 Richard A. Levin, Ph.D., Associate Professor, *Academic Senate Distinguished Teaching Award*
 Kari E. Lokke, Ph.D., Associate Professor
 Clarence Major, Ph.D., Professor
 Arthur E. McGuinness, Ph.D., Professor
 Sandra J. McPherson, B.A., Professor
 Patricia L. Moran, Ph.D., Assistant Professor
 Linda A. Morris, Ph.D., Senior Lecturer
 Marijane Osborn, Ph.D., Associate Professor
 Mark A. Reid, Ph.D., Associate Professor
 David A. Robertson, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*
 Winfried Schleiner, Ph.D., Professor
 Gary Snyder, B.A., Professor
 Margit K. Stange, Ph.D., Assistant Professor
 Elizabeth Tallent, B.A., Professor
 David Van Leer, Ph.D., Associate Professor
 Raymond B. Waddington, Ph.D., Professor
 Alan B. Williamson, Ph.D., Professor
 Karl F. Zender, Ph.D., Professor

Emeriti Faculty

Everett Carter, Ph.D., Professor Emeritus
 Thomas A. Hanzo, Ph.D., Professor Emeritus
 Wayne Harsh, Ph.D., Professor Emeritus
 Robert H. Hopkins, Ph.D., Professor Emeritus
 James J. Murphy, Ph.D., Professor Emeritus
 Gwendolyn Schwabe, M.A., Senior Lecturer Emerita
 Karl J. Shapiro, Professor Emeritus
 Daniel Silvia, Ph.D., Professor Emeritus
 Brom Weber, Ph.D., Professor of American Literature Emeritus
 James L. Woodress, Ph.D., Professor Emeritus
 Celeste T. Wright, Ph.D., Professor Emerita

The Major Program

The study of English develops skills in reading analytically and perceptively and in writing clearly and with effect.

The Program. The English department offers three kinds of courses: composition courses, undergraduate courses, and graduate courses. Composition courses develop skills in reading analytically and in writing persuasively. Undergraduate and graduate courses cover the entire range of English and American literature, as well as creative writing. Students majoring in English may elect a *teaching* emphasis, a *creative writing* emphasis, or a *general literature* emphasis. The teaching emphasis focuses on the study of composition and of language. The writing emphasis focuses on fiction, poetry, and article writing. Creative writing majors have an opportunity to work with distinguished professional writers of fiction and poetry. The general literature emphasis focuses on a series of related courses in various historical periods of English and American literature. A Senior Honors Program is available to an invited group of English majors, who prepare and write a Senior Thesis (either a research paper or creative writing) in their final year. Graduate courses lead to the M.A. and Ph.D. degrees.

Career Alternatives. Graduates have found the major excellent pre-professional training for graduate study in English, as well as for careers in teaching, law, medicine, and library work. Many graduates are employed in journalism, publishing, advertising, and public information. Others have worked in local, state, and federal government agencies, as well as in industry and agriculture. Some have even established their own businesses.

A.B. Degree Requirements:

	UNITS
Preparatory Subject Matter	20
English 1 or 3	4
English 45	4
English 46A, 46B, 46C	12
Depth Subject Matter (for each emphasis, see below)	44
Core requirement for all emphases	24
A. Shakespeare: English 117A, 117B, or 117C	4
B. British literature—two courses in periods prior to 1800: English 111, 113A, 113B, 115, 122, 123, or suitable sections of 150, 155, or 177	8
C. American literature—two courses, one pre-Civil War (English 142, 143, or appropriate sections of 158 or 177); one post-Civil War (English 144, 146, or suitable sections of 152, 158, 177, 178, 179, 181, 185A, or 185B)	8
D. Senior Seminar: One course selected from English 187, 188, 189, 194H	4
Area of Emphasis (choose one)	20
<i>General Emphasis</i>	
Five upper division English electives	20
<i>Creative Writing Emphasis</i>	
Three sections of English 100F, 100P and/or 100NF	12
Two upper division English electives	8
(Students pursuing the Creative Writing Emphasis may replace the senior seminar portion of the core requirement with a third upper division English elective of 4 units.)	
<i>Teaching Emphasis</i>	
English 103	4
English 105A or 105B	4
One course selected from English 178, 179, 181 or an ethnic literature course from outside the English department	4
Two upper division English electives	8
Total Units for the Major	64

English Majors

Up to four upper division units in a national literature other than English or American, or in Comparative Literature, may count toward the requirements of the major.

Minor Program Requirements:

	UNITS
English	19-20
Five upper division courses, at least four of which will be literature courses.....	19-20

Campus Writing Center. The Campus Writing Center, an affiliate of the English Department, is a program designed to provide writing instruction across the curriculum. Of special interest to students are its adjunct writing courses, which are offered to students who are simultaneously enrolled in specified courses in other disciplines. Topics of instruction and writing assignments in each adjunct course all relate to the subject matter of the companion course. These are credit-bearing courses offered in conjunction with both lower and upper division courses in agriculture, engineering, and letters and sciences. Interested students and faculty should contact the Campus Writing Center, telephone 916-752-8024, for the current schedule of courses.

Subject A. Students must have met the Subject A requirement before taking any course in English.

Prerequisites. English 1 or 3 is required for admission into courses 20, 30A, 30B, 45, 46A, 46B, 46C, and all upper division courses, unless otherwise stated in the course listings. Course 45 is recommended as preparation for the 46 series. Students taking GE-certified upper division courses in English may substitute Comparative 1, 2, 3, or 4 for English 1 or 3.

Meeting for Majors. All new and prospective English majors are invited to attend a general meeting for majors at the beginning of each year; all English majors must see their advisers, individually, in the spring quarters of their sophomore and junior years.

Undergraduate Adviser: Contact department.

Major Advisers. W.E. Baker, M. Byrd, C.A. Cioffi, P.A. Dale, S.M. Gilbert, J.O. Hayden, P.L. Hays, W.J. Hicks, M.J. Hoffman, R.A. Levin, K.E. Lokke, C. Major, A.E. McGuinness, S.J. McPherson, P.L. Moran, L.A. Morris, M. Osborn, M. Reid, W. Schleiner, M.K. Stange, E. Tallent, D. Van Leer, R.B. Waddington, A.B. Williamson, K.F. Zender.

Foreign Languages. Students who contemplate advanced study in English should prepare for foreign language requirements for higher degrees, and should consult with the graduate adviser.

Honors and Honors Program. The honors program consists of four units of 194H and four units of 195H, normally taken during the fall and winter quarters of the senior year. Completion of the program is a prerequisite for High or Highest Honors at graduation. Eligibility criteria and application materials may be obtained at the Undergraduate Office, 114 Sproul Hall. Refer to the Academic Information section and the College section for Dean's Honors List information.

Teaching Credential Subject Representative. R.A. Levin. See also under Teacher Education Program.

Graduate Study. The Department of English offers programs of study and research leading to the M.A. and Ph.D. degrees. Detailed information may be obtained from the graduate adviser or the Chairperson of the Department.

The department's affiliation with the Critical Theory Program also provides the opportunity for students in English to prepare for the designated emphasis in Critical Theory (an interdisciplinary program in theories and methodologies in the Humanities and Social Sciences).

Graduate Adviser. Contact department.

Courses in English (ENL)

Lower Division Courses

***A. Language Skills (2) I, II, III.** The Staff (Chairperson in charge)
Lecture/discussion—4 hours. Introductory course to help students gain writing proficiency required for successful University-level work. Focus on critical thinking, reading, and writing; on the fundamentals of essay writing; and on the relationship between writing mechanics and coherent thought. This course must be taken for a letter grade. Minimum passing grade is a C; students receiving a C- or below must repeat course. Satisfies Subject A requirement. (Counts as 4 units toward minimum progress.)

R. Communications Skills Workshop (0) I. The Staff (Chairperson in charge)
Lecture—4 hours; workshop—2 hours; reading laboratory—1 hour. Workshop in language skills for students from non-standard-English backgrounds who need to strengthen basic skills before taking English 57 (offered by Sacramento City College). Course worth 6 units toward minimum study list requirement. (P/NP grading only.)

1. Expository Writing (4) I, II, III. The Staff (Chairperson in charge)
Lecture/discussion—4 hours. Prerequisite: completion of Subject A requirement. Composition, the essay, paragraph structure, diction, and related topics. Frequent writing assignments will be made.

3. Introduction to Literature (4) I, II, III. The Staff (Chairperson in charge)
Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement. Introductory study of several genres of English literature, emphasizing both analysis of particular works and the range of forms and styles in English prose and poetry. Frequent writing assignments will be made. General Education credit: Civilization and Culture.

***4. Critical Inquiry and Literature: Freshman Seminar (4) I.** The Staff (Chairperson in charge)
Seminar—4 hours. Prerequisite: completion of Subject A requirement and consent of instructor; enrollment limited to freshmen. Critical inquiry into significant literary texts. Emphasis on close reading, classroom dialogue, and the writing of several papers or a longer seminar paper. General Education credit: Civilization and Culture.

5F. Introduction to Creative Writing: Fiction (4) I, II, III. The Staff (Chairperson in charge)
Lecture/discussion—4 hours. Prerequisite: completion of Subject A requirement. The elementary principles of writing fiction. Students will write both in prescribed forms and in experimental forms of their own choosing. No final examination.

5P. Introduction to Creative Writing: Poetry (4) I, II, III. The Staff (Chairperson in charge)
Lecture/discussion—4 hours. Prerequisite: completion of Subject A requirement. The elementary principles of writing poetry. Students will write both in prescribed forms and in experimental forms of their own choosing. No final examination.

20. Intermediate Composition (4) I, II, III. The Staff (Chairperson in charge)
Lecture/discussion—4 hours. Prerequisite: course 1 or 3. Emphasis on the grammatical patterns of standard English, sentence revision techniques, development of coherent paragraphs, and the formal properties of the expository essay.

30A. Survey of American Literature (4) I. The Staff; II. Van Leer
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 3. American literature from the seventeenth century to 1865. General Education credit: Civilization and Culture.

30B. Survey of American Literature (4) I, II. The Staff; III. Robertson
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 3. American literature from 1865 to the present. General Education credit: Civilization and Culture.

45. Close Reading of Poetry (4) I, II, III. The Staff (Chairperson in charge)
Lecture/discussion—4 hours. Prerequisite: course 1 or 3. Close reading of selections from English and American poetry. Frequent written exercises.

46A. Masterpieces of English Literature (4) II. Osborn; III. Schleiner
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 3. Selected works of principal writers to 1640. History of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

46B. Masterpieces of English Literature (4) I. The Staff; II. Byrd
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 3. Selected works of principal writers from 1640 to 1832. History of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

46C. Masterpieces of English Literature (4) I. The Staff; III. Moran
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 3. Selected works of principal writers from 1832 to present. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

92. Internship in English (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: course 1 or 3. Internships in fields where students can practice their skills. May be repeated for credit for a total of 12 units. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: course 1 or 3. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100F. Creative Writing: Fiction (4) I, II, III. The Staff (Chairperson in charge)
Discussion—4 hours; development and evaluation of written materials, and conferences with individual students. Prerequisite: course 5F or 5P, or consent of instructor; priority given to English (Creative Writing) majors. Writing of fiction. May be repeated for credit with consent of instructor. No final examination.

100NF. Creative Writing: Non-Fiction (4) III. Hicks
Discussion—4 hours; development and evaluation of written materials, and conferences with individual students. Prerequisite: course 1 or 3, or consent of instructor; priority given to English (Creative Writing) majors. Writing of non-fiction. May be repeated for credit with consent of instructor. No final examination.

100P. Creative Writing: Poetry (4) I, II, III. The Staff (Chairperson in charge)
Discussion—4 hours; development and evaluation of written materials, and conferences with individual students. Prerequisite: course 5F or 5P, or consent of instructor; priority given to English (Creative Writing) majors. Writing of poetry. May be repeated for credit with consent of instructor. No final examination.

102. Adjunct Writing (3) I, II, III. The Staff (Chairperson in charge)
Discussion—3 hours. Prerequisite: course 1 or 3; concurrent enrollment in a specified course in a subject-matter discipline. Instruction in the elements of expository writing, with special emphasis on their application to writing projects in a specified academic discipline. May be repeated once for credit if taken in conjunction with a different subject-matter course.

103A-F. Advanced Composition (4) I, II, III. The Staff (Chairperson in charge)
Lecture/discussion—3 hours; individual evaluations and conferences. Prerequisite: course 1 or 3; course 20 recommended. Instruction and practice in a variety of modes of composition. Frequent written assignments. One area required of teaching credential candidates (section "F" strongly recommended). Study areas are: (A) General; (B) Legal Writing; (C) Article Writing; (D) Report Writing; (E) Technical Writing; (F)

Composition for Elementary and Secondary Teachers. May be repeated once for credit in different area of emphasis.

104. Scientific Writing (3) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours; conference—1 hour. Prerequisite: upper division enrollment in a science curriculum. Analysis and practice of scientific writing; research methods, organization, proper style and format, oral presentation of scientific papers. Lecture and workshop-discussions by English and science department staff. (P/NP grading only.)

***105A. Language** (4) I, II. The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Present-day English grammar and pronunciation according to the perspectives of traditional grammar and contemporary linguistics. Preparation for stylistic analysis and historical study of English language and literature. Required of teaching credential candidates.

105B. Language (4) II, III. Schleiner
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. History of the English language. Examination of the language as recorded from Old English to present-day English. Relationship of English to other languages; development of vocabulary, phonology, and grammatical patterns. Required of teaching credential candidates.

***110A. Introduction to Principles of Criticism** (4)
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Essentials of literary criticism and its history from Aristotle to the modern era, with emphasis on the major critics.

110B. Introduction to Principles of Criticism (4) II. Hoffman
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. History of literary criticism in the modern era, with emphasis on the ties with the past and the special problems presented by modern literary theory.

111. Medieval Literature (4) I. Osborn
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historically or thematically focused intensive examination of topics in medieval literature. May be repeated for credit when content differs.

113A. Chaucer: *Troilus* and the "Minor" Poems (4) II. Cioffi

Lecture—3 hours; term paper. Prerequisite: course 1 or 3. Development of the poet's artistry and the evolution of the poet's ideas from his first work to his culminating masterpiece, *Troilus and Criseyde*. Courses 113A and 113B need not be taken in sequence.

113B. Chaucer: *The Canterbury Tales* (4) III. Cioffi
Lecture—3 hours; term paper. Prerequisite: course 1 or 3. *The Canterbury Tales* complete as a work of art. Courtly love, literary forms, medieval science and astrology, theology and dogma as they inform the reading of Chaucer. Courses 113A and 113B need not be taken in sequence.

115. Renaissance Literature (4) I. Levin, Schleiner
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historically or thematically focused study of works of the Renaissance. May be repeated for credit when content differs.

117A. Shakespeare: The Early Works (4) I. Waddington; II. Zender
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Selected major works from Shakespeare's early period, up to 1599. Courses 117A-117B-117C need not be taken in sequence.

117B. Shakespeare: The Middle Period (4) II. Levin; III. Zender
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Selected major works from Shakespeare's middle period, up to 1604. Courses 117A-117B-117C need not be taken in sequence.

117C. Shakespeare: The Later Works (4) I. Schleiner; III. Levin
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Selected major works from Shakespeare's later period. Courses 117A-117B-117C need not be taken in sequence.

118. Shakespeare (4) I. Waddington
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Selected major works by Shakespeare. Recommended for non-majors. May not be applied toward the English major. General Education credit: Civilization and Culture.

122. Milton (4) II. Waddington
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Selected major works, including *Paradise Lost*.

123. 18th-Century British Literature (4) I. Byrd
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historically or thematically focused study of 18th-century English literature. May be repeated for credit when content differs.

130. British Romantic Literature (4) II. Lokke
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historically or thematically focused study of works of Romantic English literature. May be repeated for credit when content differs.

133. 19th-Century British Literature (4) III. The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historically or thematically focused study of works of 19th-century English literature. May be repeated for credit when content differs.

137. 20th-Century British Literature (4) I. Moran; III. The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historically or thematically focused study of works of 20th-century English literature. Authors who might be taught are Conrad, Joyce, Eliot, Woolf, Larkin. May be repeated for credit when content differs.

142. Early American Literature (4) III. Van Leer
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historically or thematically focused study of American literature of the 17th and 18th centuries. May be repeated for credit when content differs.

143. 19th-Century American Literature to the Civil War (4) I. The Staff; II. Stange, III. Van Leer
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historically or thematically focused study of works of 19th-century American literature. May be repeated for credit when content differs.

144. Post-Civil War American Literature (4) I, II. The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historically or thematically focused study of works in post-Civil War American literature. May be repeated for credit when content differs.

146. 20th-Century American Literature (4) II. Hays; III. Hicks
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historically or thematically focused study of works of 20th-century American literature. May be repeated for credit when content differs.

***149. Topics in Literature** (4)
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Intensive examination of literature considered in topical terms, not necessarily historically. May be repeated for credit when topic differs.

150. British Drama (4) III. Cioffi
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historical or thematic study of English drama. May be repeated for credit when topic differs.

152. American Drama (4) I. Hays
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Study of American dramatic literature. Either a historical survey from 18th-century beginnings to the present or an in-depth analysis of fewer playwrights, such as O'Neill, Miller, Williams. May be repeated for credit when topic differs.

***153. Topics in Drama** (4)
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historical or thematic study of drama. May be repeated for credit when topic differs.

155. British Novel (4) I. Baker; II. Moran
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historically or thematically focused

examination of the British novel. May be repeated for credit when topic differs.

156. The Short Story (4) II. The Staff; III. Moran
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. The short story as a genre; its historical development, techniques, and formal character as a literary form. European as well as American writers. General Education credit: Civilization and Culture.

158. American Novel (4) I. Hoffman; III. Stange
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historically or thematically focused intensive study of major American novels. May be repeated for credit when topic differs.

159. Topics in the Novel (4) I. Williamson/Tallent
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Examination of major novels arranged thematically. Topics might include Bildungsroman, stream-of-consciousness novel, Gothic novel, historical novel.

160. Film As Narrative (4) III. Reid
Discussion—2 hours; lecture and film study—3 hours. Prerequisite: course 1 or 3. Study of modern film (1930 to the present) as a storytelling medium.

***162. Film Theory and Criticism (4)**
Lecture—1 hour; discussion—2 hours; laboratory—3 hours. Prerequisite: course 1 or 3. Film theory and criticism, with a study of ten major works of international film art. Offered in alternate years. General Education credit: Civilization and Culture.

165. Topics in Poetry (4) II. Williamson; III. McPherson

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3 and course 45. Intensive examination of various topics expressed in poetry from all periods of English and American literature. May be repeated for credit when topic covers different poets and poems.

***171A. The Bible as Literature: The Old Testament (4)**

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. May be taken independently of course 171B. Selected readings from the Old Testament illustrating various literary forms. Emphasis on the Pentateuch, the Historical Books, and the Wisdom Books. Offered in alternate years. General Education credit: Civilization and Culture.

***171B. The Bible as Literature: Prophets and New Testament (4)**

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. May be taken independently of course 171A. Selected readings from the Old Testament prophets and the New Testament. Offered in alternate years. General Education credit: Civilization and Culture.

***173. The Literature of Science Fiction (4)**

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Study of the literary modes and methods of science fiction. The course will analyze representative novels and short stories which exemplify major themes and styles in this genre—e.g., time travel; alternative universes; utopian, anthropological, sociological science fiction.

***175. American Literary Humor (4)**

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3, or standing above freshman level. American humorous vision of man, nature, and the supernatural. Includes one or more of the following: colonial humor; southwestern and New England humor; pre- and post-Civil War masters; local colorists; journalistic gadflies; anti-provincialists; modernist poets and prose writers; black humor.

177. Study of an Individual Author (4) I, II, III. Morris; III. Hays

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Survey of the works of an individual author other than Chaucer, Shakespeare, or Milton. May be repeated for credit when a different author is studied.

***178. Special Topics in Ethnic Literature (4)**

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Intensive study of a topic drawn from multiethnic literature. Course may focus on par-

ticular ethnic groups, historical periods, writers, genres, and/or themes. May be repeated once for credit when subject matter differs.

179. Multi-Ethnic Literature (4) I, II. The Staff

Lecture/discussion—3 hours; papers. Prerequisite: course 1 or 3, or standing above freshman level. Fiction, poetry, and other writings by Americans of ethnic minority background (Native, Black, Hispanic, Jewish, Italian, etc.) which reveal their immigrant experience, cultural diversity, and contributions to American literature.

***180. Children's Literature (4)**

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historical backgrounds and development of types of children's literature, folklore and oral tradition, levels of interest, criticism and evaluation, illustration and bibliography.

181A. African American Literature to the Harlem Renaissance (4) II. Reid, Morris

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3 or the equivalent. African American literature from the slavery period to the end of the 1930s. Particular attention to the rapid development of the African American literary culture from a primarily oral tradition. Offered in alternate years.

181B. African American Literature from the Harlem Renaissance (4) III. Reid, Morris

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3 or the equivalent. Major African American writers in the context of cultural history from 1940 to the present. Writers may include Richard Wright, Ann Petry, James Baldwin, Ralph Ellison, Paule Marshall, Toni Morrison, Alice Walker, Clarence Major. Offered in alternate years.

***182. Literature of California (4)**

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. California literature in the context of California's social, political, and intellectual history. Reading of poetry, fiction, and essays. Emphasis on nineteenth- and twentieth-century naturalists, turn of the century novelists, the Beats, and writers of the last two decades. Offered in alternate years. General Education credit: Civilization and Culture.

184. Literature of the Wilderness (4) II. Robertson

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Study of the theme of wilderness primarily in American Literature, with some consideration of Biblical and European antecedents. Major attention given to Thoreau, Muir, London, Austin, Faulkner, Snyder, and Abbey. Offered in alternate years. General Education credit: Civilization and Culture.

185A. Literature by Women I (4) I. Stange

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. English language literature by women from Bradstreet and Behn to the Brontës, Eliot, and Dickinson. The effects of social constraints upon women's art; the rise of feminism; new trends in literary criticism.

185B. Literature by Women II (4) III. Gilbert

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3; course 185A recommended. English language literature by women from Chopin and Woolf to Plath, Rich, and Morrison. The effects of social constraints upon women's art; the rise of feminism; new trends in literary criticism.

187. Literature and the Other Arts (4) III. Stange

Seminar—3 hours; term paper. Prerequisite: junior or senior standing with a major in English or consent of instructor. Group study of the relationship between the forms of literature and the forms of the other arts, with detailed study of one of the crucial periods of artistic development in western culture.

188. Special Topics in Literary Studies (4) I, II, III.

The Staff (Chairperson in charge)
Seminar—3 hours; term paper. Prerequisite: junior or senior standing with a major in English or consent of instructor. Group study of a special topic drawn from English or American literature. Course will be offered in sections according to the topic studied, and papers will be assigned. Limited enrollment.

189. Seminar in a Major Writer (4) I, II. The Staff

(Chairperson in charge)
Seminar—3 hours; term paper. Prerequisite: junior or senior standing; a major in English or consent of instructor. One major writer's artistic development with attention to intellectual and literary milieu. Limited enrollment.

192. Internship in English (1-12) I, II, III. The Staff

(Chairperson in charge)
Internship—3-36 hours. Prerequisite: course 1 or 3. Internships in fields where students can practice their skills. A maximum of 4 units is allowed toward the major in English. May be repeated for credit for a total of 12 units. (P/NP grading only.)

194H. Special Study for Honors Students (4) I. The Staff (Chairperson in charge)

Seminar—3 hours; term paper. Prerequisite: admission to English Department Senior Honors Program. Study of a special literary topic or of the works of a major writer, and preparation for writing an honors thesis in course 195H.

195H. Honors Thesis (4) II. The Staff (Chairperson in charge)

Independent study—12 hours. Prerequisite: course 194H. Preparation of a thesis, under the supervision of an instructor. Students satisfying requirements for the general major or the teaching emphasis write on a scholarly or critical subject; creative writing students submit a volume of poems or fiction.

197T. Tutoring in English (1-5) I, II, III. The Staff

(Chairperson in charge)
Tutoring—1-5 hours. Prerequisite: upper division standing and consent of Chairperson. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. Does not fulfill requirement for major. May be repeated for credit for a total of 8 units. (P/NP grading only.)

197TC. Community Tutoring in English (1-4) I, II, III. The Staff (Chairperson in charge)

Tutoring—1-4 hours. Prerequisite: upper division standing and a major in English; consent of Chairperson. Field experience, with individuals or in classroom in instruction of English language, literature, and composition. Does not fulfill requirement for major. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge)
Prerequisite: one course from courses 1, 3, 5F, 5P. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

200. Techniques of Literary Scholarship (4) II.

Waddington
Discussion—3 hours; term paper. The elements of bibliography with special attention to literature and discussion of the principal modes of literary investigation—critical, historical, textual, and others.

***201. Literary Criticism (4)**

Discussion—3 hours; term paper. Survey of the major critics from Aristotle to the present, with emphasis on the relationship of critical theory to the history of literature.

205. Anglo-Saxon Language and Culture (4) I.

Osborn
Lecture—3 hours; conference and term paper. The language and culture of Anglo-Saxon England; readings in Old English prose and poetry. Offered in alternate years.

206. Beowulf (4) II. Osborn

Discussion—3 hours; oral and written reports; conferences with students. Prerequisite: course 205 or the equivalent. A study of the poem and the Heroic Age of Germanic literature. Offered in alternate years.

***207. Middle English (4)**

Discussion—3 hours; term paper. Study of the phonology, morphology, syntax, and lexicon between 1100 and 1500 with investigation of the regional dialects; pertinent facts on both the internal and external linguistic history; intensive reading of texts.

- *209. Present-Day English Linguistics (4)**
Discussion—3 hours; term paper. Theory and methods of structural linguistics and transformational grammar as applied to the analysis of English. Emphasis will be on recent linguistic techniques, particularly as these relate to the teaching of language, literature, and composition.
- 210. Readings in English and American Literature (4)** III. Hoffman
Seminar—3 hours; conference—1 hour. Prerequisite: upper division English course in area to be studied. Offered in multiple sections each quarter. Content varies according to speciality of instructor. Course designed for students preparing for their comprehensive examinations. May be repeated for credit.
- *215. Middle English Romance (4)**
Seminar—3 hours; conference. The sources of Medieval Romance genre. Continental and English literary treatment; significant change of attitudes in post-Malory literature.
- *225. Topics in Irish Literature (4)**
Seminar—3 hours; conference—1 hour. Prerequisite: course 139. Course will vary from quarter to quarter and will include such topics as the nineteenth-century novel, contemporary Irish poetry, rise of the drama, or a study of a major author.
- *230. Study of a Major Writer (4)**
Seminar—3 hours; conferences with individual students—1 hour; research papers. Artistic development of one major writer and his intellectual and literary milieu. May be repeated for credit when a different writer is studied.
- 232. Problems in English Literature (4)** II. Schleiner
Seminar—3 hours; conferences with individual students—1 hour. Selected issues in the current study and critical assessment of a limited period or topic in English literature. May be repeated for credit when different period or topic is studied.
- 233. Problems in American Literature (4)** II. Reid; III. Robertson
Seminar—3 hours; conferences with individual students—1 hour; research papers. Selected topics for intensive investigation. May be repeated for credit when different topic or period is studied.
- 234. Dramatic Literature (4)** I. Hays
Seminar—3 hours; conference—1 hour. Historical introduction to dramatic theory; the genres of tragedy, comedy, and tragicomedy.
- 235. Theory of Fiction (4)** I. Hicks
Seminar—3 hours; preparation and evaluation of paper on a work of fiction. Theories of fiction as they relate to the professional writer's practice of the craft. Designed for students in the creative writing program.
- 236. Poetics (4)** II. McPherson
Seminar—3 hours; conference—1 hour. Structure, prosody, and idiom of British and American poetry variably approached—sometimes through an intensive study of a single writer, sometimes historically or theoretically—at the instructor's discretion. Preparation and evaluation of research papers. Directed toward Creative Writing master's degree students.
- *237. Modern Critical Theory (4)**
Seminar—3 hours; conference—1 hour. Examination of problems in the theory underlying the practice of literary criticism from I.A. Richards and T.S. Eliot to the present.
- *238. Special Topics in Literary Theory (4)**
Seminar—3 hours; term paper. Prerequisite: course 237 or the equivalent. Advanced topics in literary theory and criticism. Preparation and evaluation of research paper. May be repeated for credit when topic and/or reading list differs. Offered in alternate years.
- *240. Medieval Literature (4)**
Seminar—3 hours; conference—1 hour. Studies of Medieval literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *242. Sixteenth-Century Literature (4)**
Seminar—3 hours; conference—1 hour. Studies in sixteenth-century literature. Course materials to be selected by the instructor. Preparation and evaluation

- of research papers. May be repeated for credit when a different topic is studied.
- 244. Shakespeare (4)** III. Waddington
Seminar—3 hours; conference—1 hour. Studies in Shakespeare. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *246. Seventeenth-Century Literature (4)**
Seminar—3 hours; conference—1 hour. Studies in seventeenth-century literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *248. Eighteenth-Century Literature (4)**
Seminar—3 hours; conference—1 hour. Studies in eighteenth-century literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- 250. Romantic Literature (4)** III. Lokke
Seminar—3 hours; conference—1 hour. Studies in Romantic literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- 252. Victorian Literature (4)** II. Dale
Seminar—3 hours; conference—1 hour. Studies in Victorian literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- 254. Twentieth-Century British Literature (4)** III. Williamson
Seminar—3 hours; conference—1 hour. Studies in twentieth-century British literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *256. Early American Literature (4)**
Seminar—3 hours; conference—1 hour. Studies in Early American literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- 258. American Literature: 1800 to the Civil War (4)** I. Van Leer
Seminar—3 hours; conference—1 hour. Studies in American literature from 1800 to Civil War. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *260. American Literature: Civil War to 1914 (4)**
Seminar—3 hours; conference—1 hour. Studies in American literature from the Civil War to 1914. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- 262. American Literature after 1914 (4)** II. Gilbert
Seminar—3 hours; conference—1 hour. Studies in American literature after 1914. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *264. Studies in Modern British and American Literature (4)**
Seminar—3 hours; conference—1 hour. Studies in modern British and American literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- 285. Literature by Women (4)** I. Moran
Seminar—3 hours; conference—1 hour. Studies in literature by women and the theoretical approaches to literature by women. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when topic and/or reading list differs.
- 290F. Seminar in Creative Writing of Fiction (4)** I. Tallent; II. Baker; III. Major
Seminar—3 hours; 1 additional hour of writing. Prerequisite: consent of instructor; graduate standing,

with preference given to those enrolled in master's program in Creative Writing. Writing of prose. Evaluation of written materials and individual student conferences. May be repeated for credit.

- *290NF. Seminar in Creative Writing of Non-Fiction (4)**
Seminar—3 hours; term paper. Prerequisite: consent of instructor; graduate standing, with preference given to those enrolled in the Master's Program in English (Creative Writing). A workshop in the writing of literary non-fiction, with emphasis—according to staff and student interest—on autobiography, biography, memoir, the occasional or nature essay, or other non-fiction prose narratives.
- 290P. Seminar in Creative Writing of Poetry (4)** I. Williamson; II. Gilbert; III. Snyder
Seminar—3 hours; 1 additional hour of writing. Prerequisite: consent of instructor; graduate standing, with preference given to those enrolled in master's program in Creative Writing. Writing of poetry. Evaluation of written materials and individual student conferences. May be repeated for credit.
- 298. Directed Group Study (1-5)** I, II, III. The Staff (Chairperson in charge) (S/U grading only.)
- 298C. Colloquium on Literary Scholarship (1-4)** I, II, III. The Staff (Chairperson in charge) (S/U grading only.)
- 299. Individual Study (1-12)** I, II, III. The Staff (Chairperson in charge) (S/U grading only.)
- 299D. Special Study for the Doctoral Dissertation (1-12)** I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Professional Courses

- *300. Problems in Teaching English Language, Literature, and Composition in Secondary Schools (3)**
Lecture—3 hours. Prerequisite: graduate standing; an English teaching major or minor. This course should be completed in conjunction with practice teaching. Course is accepted in partial satisfaction of the requirement in education for the general secondary credential.
- 390. Teaching English at the College Level (4)** I.
Lecture—2 hours; discussion—2 hours. Prerequisite: graduate standing. Consideration of the problems and techniques of teaching composition and literature at the college level. (S/U grading only.)
- 392. Teaching Internship in English (4)** I, II. (Director of Composition in charge)
Supervised internships—4 hours. Prerequisite: graduate standing. In-class internship with English Department faculty member. (S/U grading only.)
- 393. Problems in Teaching College Composition (2)** I. (Director of Composition in charge)
Discussion—2 hours. Prerequisite: open to graduate students teaching composition in a variety of University courses including English A, 1, 3, 5, 20, 102, and 103. Designed for the relatively experienced student teacher who would profit from developing skills in specific areas. (S/U grading only.)

Entomology

(College of Agricultural and Environmental Sciences)
Michael P. Parrella, Ph.D., Chairperson of the Department
Department Office, 367 Briggs Hall (916-752-0475)

Faculty

James R. Carey, Ph.D., Professor
Hugh Dingle, Ph.D., Professor
Sean S. Duffey, Ph.D., Professor
Lester E. Ehler, Ph.D., Professor
Bruce F. Eldridge, Ph.D., Professor
Mary L. Flint, Ph.D., Lecturer

Norman E. Gary, Ph.D., Professor
 Larry Godfrey, Ph.D., Lecturer
 Jeffrey Granett, Ph.D., Professor
 Bruce D. Hammock, Ph.D., Professor (*Entomology, Environmental Toxicology*)
 Richard Karban, Ph.D., Professor
 Harry K. Kaya, Ph.D., Professor (*Entomology, Nematology*)
 Lynn S. Kimsey, Ph.D., Associate Professor
 G. A. H. McClelland, Ph.D., Senior Lecturer
 Susumu Maeda, Ph.D., Associate Professor
 Fumio Matsamura, Ph.D., Professor (*Entomology, Environmental Toxicology*)
 Robert E. Page, Ph.D., Professor
 Michael P. Parrella, Ph.D., Professor (*Entomology, Environmental Horticulture*)
 Christine Y. S. Peng, Ph.D., Professor
 Richard E. Rice, Ph.D., Lecturer
 Jay A. Rosenheim, Ph.D., Associate Professor
 Arthur Shapiro, Ph.D., Professor (*Entomology, Evolution and Ecology*)
 Robbin W. Thorp, Ph.D., Professor
 Phillip S. Ward, Ph.D., Professor
 Robert K. Washino, Ph.D., Professor
 Frank G. Zalom, Ph.D., Lecturer

Emeriti Faculty

Oscar G. Bacon, Ph.D., Professor Emeritus
 Richard M. Bohart, Ph.D., Professor Emeritus
 Albert A. Grigarick, Jr., Ph.D., Professor Emeritus
 Charles L. Judson, Ph.D., Professor Emeritus
 Harry H. Laidlaw, Jr., Ph.D., Professor Emeritus
 W. Harry Lange, Jr., Ph.D., Professor Emeritus
 Donald L. McLean, Ph.D., Professor Emeritus
 Timothy Prout, Ph.D., Professor Emeritus
 Francis M. Summers, Ph.D., Professor Emeritus

The Major Program

The Entomology major is a general biological curriculum of interest to students intrigued by insects, their diversity and biology. Areas of emphasis include: agricultural entomology, bee management and biology, behavior, ecology, insects affecting human and animal health, natural history, and physiology.

The Program. Students begin their study in entomology with selected insect biology courses. After completing these courses, students may enroll in courses in their particular area of interest. A student interested in agricultural entomology, for example, could enroll in courses such as economic entomology, biological control of insects, and apiculture.

Internships and Career Alternatives. Entomology majors have participated in internships with the State Department of Agriculture in the areas of insect identification, insect surveys, and the development of entomological libraries. Other interns have worked with professional entomologists in the area of supervised pest control. Graduates are prepared for managerial and technical positions with state and federal agencies and agricultural production or supporting industry; entomology graduates also teach biological sciences in high schools. Others matriculate in graduate programs leading to a higher degree.

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable and may be critical for the attainment of some career goals. *Courses shown without parentheses are required.*)

English Composition Requirement	0-8
See College Requirement	
Preparatory Subject Matter	46-47
Biology (Biological Sciences 1A, 1B, 1C).....	15
Chemistry (Chemistry 2A, 2B, 8A, 8B).....	16
Mathematics 16A.....	3
Physics (Physics 1A, 1B).....	6
Statistics (Statistics 13, 32, or Agricultural Systems and Environment 150).....	3-4
Computer science or additional statistics (Agricultural Systems and Environment 21, Engineering 5, or Mathematics 16B).....	3

Breadth Subject Matter	6-24
Satisfaction of General Education requirement.....	6-24
Depth Subject Matter	32-36
Cell or microbiology (Microbiology 102, Plant Biology 118, 119, Plant Pathology 120, Veterinary Microbiology and Immunology 132).....	4-5
Biological Sciences 101.....	4
Ecology (Environmental Studies 100 or Evolution and Ecology 101).....	4
Evolution (Evolution and Ecology 100).....	3-4
Physiological chemistry (Biological Sciences 102 and 103).....	6
Entomology 100, 100L.....	5
At least 7 units from Entomology 101, 102, 103, 104, 107, 109, or 116.....	7
Restricted Electives	34
Upper division entomology courses.....	14
Upper division electives related to student's interest with approval of adviser.....	20
Note: No more than a total of 6 units from Entomology 192, 197T and 199 may count toward fulfilling depth subject matter or restricted elective units.	
Unrestricted Electives	32-60
Total Units for the Major	180

Major Adviser. J. Granett.

Minor Program Requirements:

The Department of Entomology has seven minor programs open to students in other disciplines who are interested in rounding out their academic study with a concentration in the area of entomology.

	UNITS
Entomology	18-24
Entomology 100, 100L.....	5
At least two courses from Entomology 101, 102, 103, 104, 107.....	7-8
At least two additional upper division Entomology courses (except courses 192, 198, 199).....	6-11

	UNITS
Agricultural Entomology	18
Entomology 100, 100L, 110, 110L, 135.....	14
At least four additional upper division Entomology units.....	4

	UNITS
Apiculture	18-23
Entomology 100, 100L, 119, 119L.....	10
Entomology 104 or 110, 110L.....	3-5
Additional courses recommended: Agronomy 120, Plant Science 102, Pomology 102.....	5-8

	UNITS
Insect Ecology	19
Entomology 100, 100L, 104.....	8
Seven units from Entomology 103, 107, 109...7	
Evolution and Ecology 149 or Environmental Studies 121.....	4

	UNITS
Medical-Veterinary Entomology	18
Entomology 100, 100L, 104, 153, 156.....	15
At least three units from Entomology 156L, Veterinary Microbiology and Immunology 126, 126L, 128, 132.....	3

Minor Adviser. J. Granett.

Graduate Study. The Department of Entomology offers a program of study and research leading to the M.S. and Ph.D. degrees. See the Graduate Studies section and the *Graduate Announcement* for further details.

Graduate Advisers. See *Class Schedule and Room Directory*.

Related Courses. See courses in Nematology.

Courses in Entomology (ENT)

Lower Division Courses

10. Natural History of Insects (3) II. Kaya/Thorp
 Lecture—3 hours. Designed for students not specializing in entomology. Not open for credit to students who have had course 100, but students who have taken this course may take course 100 for credit. An introduction to the insects detailing their great variety, structures and functions, habits, and their significance in relation to plants and animals including man.

17. Natural Selection and Sociobiology (4) I. The Staff
 Lecture—3 hours; discussion—1 hour. Introduction to the theory of natural selection, using evaluations and applications of behavioral adaptations, ranging from insects to humans. General Education credit: Nature and Environment.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
 (P/NP grading only.)

Upper Division Courses

100. General Entomology (3) I. Granett in charge
 Lecture—3 hours. Prerequisite: Biological Sciences 1B. Biology, anatomy, physiology, development, classification, ecology and relation of insects to human welfare.

100L. General Entomology Laboratory (2) I. Granett in charge
 Laboratory—6 hours. Prerequisite: course 100 (may be taken concurrently). Anatomy, development, population ecology, methods of collecting, classification and identification of insects of all orders and of major families.

101. Functional Insect Morphology (3) II. Peng
 Lecture—2 hours; laboratory—3 hours. Prerequisite: course 100. Study of the basic external and internal structures, organs and tissues of insects, with emphasis on functional systems. Functional anatomy, histology and fine structures of important organs and tissues will be discussed.

102. Insect Physiology (4) III. Duffey, Hammock,
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or course in physiology or invertebrate zoology. Processes by which insects maintain themselves, reproduce, and adapt to environment. Insects as models for basic/applied research through detailed analysis of metabolic, physiological, and behavioral processes. Emphasis on analysis of methodology, fact, and theory.

103. Insect Systematics (3) III. Ward
 Lecture—2 hours; discussion—1 hour. Prerequisite: introductory course in zoology or entomology. Principles and methods of systematics, with particular reference to insects. Emphasis on different theories of classification, and analysis of phylogenetic relationships.

104. Behavioral Ecology of Insects (3) II. Page
 Lecture—3 hours. Prerequisite: introductory biology or zoology. Basic principles and mechanisms of insect behavior and ecology. An evolutionary approach to understanding behavioral ecology of insects.

***107. California Insect Diversity (5) III.** Thorp, Kimsey
 Lecture—1 hour; laboratory—6 hours; fieldwork—6 hours. Prerequisite: an introductory course in entomology. Survey of the diversity of insects from selected ecological zones in California with emphasis on collection, identification, and natural history. Offered in alternate years.

109. Field Taxonomy and Ecology (7) Extra-session summer. Ward
 Lecture—2 hours; laboratory—36 hours; five-week course. Prerequisite: an introductory course in entomology or consent of instructor. The study of insects in their natural habitats; their identification and ecology. Offered in alternate years.

110. Economic Entomology (3) II. Parrella
 Lecture—3 hours. Prerequisite: Biological Sciences 1B. Identification, biology, and control of insects and

*Course not offered this academic year.

mites that cause economic losses. Emphasis is placed on the management of agricultural pests but includes structural, household, storage and ornamental pest problems.

110L. Arthropod Pest Management Laboratory (2) II. Parrella

Laboratory—6 hours. Prerequisite: course 110 (may be taken concurrently) and Biological Sciences 1B. Identification, biology and control of insects and mites that cause economic losses. Emphasis is placed on the management of agricultural pests but includes structural, household, storage, and ornamental pest problems.

111. Insects and Human Affairs (4) II, III. McClelland

Lecture—2 hours; discussion—1 hour; film/demonstration—1 hour; one required evening meeting. Prerequisite: Biological Sciences 10 recommended. Diversity, structure and function of insects. Their role as benefactors, competitors, and destroyers of human resources and health. Their contribution to human culture and scientific knowledge. Approaches to insect pest control and its environmental, social and political correlates. General Education credit: Nature and Environment.

116. Biology of Aquatic Insects (3-5) III. The Staff
Lecture—2 hours and laboratory (Saturday field trips); optional laboratory on identification and/or aquatic insect collection. Prerequisite: course 100 or consent of instructor. A study of the life history, ecology, and identification of insects associated with streams, ponds, and lakes.

119. Apiculture (3) III. Peng

Lecture—3 hours; papers. Prerequisite: Biological Sciences 1C recommended. Biology and behavior of honeybees; communication, orientation, social organization, foraging activities, honey production, pollination activities. General Education credit: Nature and Environment.

119L. Apiculture Laboratory (2) III. Peng

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 119. Biology and behavior of honey bees; fundamentals of culture, management, and use of colonies for agricultural, recreational, teaching, and research purposes.

135. Introduction to Biological Control (4) III. Ehler, Kaya

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100 or 110. Principles of biological control of arthropod pests and weeds. Biology of pathogens, entomopathogenic nematodes, parasitoids, and predators. Implementation in classical and augmentative biological control. Role of biological control in pest management.

147. Evolution of Life on Earth (4) I. Kimsey

Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Biology 10 or Biological Sciences 10. Relationships between physical changes in the continents and the evolution and diversification of plants and animals, particularly insects, over the past 400 million years. General Education credit: Nature and Environment.

153. Medical Entomology (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in one of the biological sciences or consent of instructor. The worldwide relationships of insects and other arthropods to human health. The biology and basic classification of medically important arthropods with special emphasis on the ecology of arthropod-borne human diseases and principles of their control. General Education credit: Nature and Environment.

156. Biology of Parasitism (3) III. Washino in charge; Theis (Medical Microbiology), Gardner
Lecture—3 hours. Prerequisite: Biological Sciences 1A or consent of instructors. Lectures on the biological and ecological aspects affecting host-parasite relationships using selected examples from protozoan and metazoan fauna.

156L. Biology of Parasitism Laboratory (1) III. Washino in charge; Theis (Medical Microbiology)
Laboratory—3 hours. Prerequisite: course 156 (con-

currently) or consent of instructor. Laboratory demonstrations using selected examples of protozoan and metazoan organisms along with various techniques used in parasitology to exemplify concepts presented in the lecture course.

192. Internship (1-12) I, II, III, extra session. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Laboratory experience or fieldwork off and on campus in all subject areas offered in the Department of Entomology. Internships supervised by a member of the faculty. (P/NP grading only.)

197T. Tutoring in Entomology (1-3) I, II, III. McClelland

Discussion—1-3 hours. Leading small discussion groups. Preview assignments and prepare guidelines for discussion. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, summer.

The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, summer. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200A. Conceptual Basis of Entomology: Basic Biology (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Selected advanced topics in contemporary entomological research with an emphasis on theoretical and fundamental aspects of natural selection, behavior, ecology, physiology, and biochemistry as relates to the regulation of insect populations. Provides the theoretical framework for course 200B.

200B. Conceptual Basis of Entomology: Application (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Selected advanced topics in contemporary entomological research with emphasis on the application of theoretical/conceptual outlines from course 200A to epidemiology, biotechnology, biological control and integrated pest management for pursuing current insect pest problems concerning food, fiber, and health.

206. Ecology of Insect Parasitoids (4) II. Rosenheim

Lecture—3 hours; seminar—1 hour. Prerequisite: introductory animal ecology or behavior. Insect parasitoids will be investigated as model systems to address current topics in behavior, population, and evolutionary ecology. Theory will be synthesized and critical empirical tests of ecological hypotheses emphasized. Offered in alternate years. (Same course as Population Biology 206.)

212. Molecular Biology of Insects and Insect Viruses (3) II. Maeda

Lecture—3 hours. Prerequisite: consent of instructor. A molecular biological analysis of insect systematics, physiology, and defense mechanisms. Molecular biology of insect viruses. Baculovirus expression vectors and post-translation modification of expressed polypeptides. Biological control of using neuropeptides and toxin genes in insect viruses.

219. Advanced Apiculture (4) III. Peng

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 119L. Current topics in bee biology with special consideration of morphology, caste determination, queen rearing, nutrition, physiology, pathology, and products of honey bees. Offered in alternate years.

220. Chemical Ecology of Plant-Insect Interactions (4) II. Duffey

Lecture—3 hours; discussion—1 hour. Prerequisite: introductory biochemistry. Investigation of the interface between plants, herbivorous insects and their natural enemies from a mechanistic point of view, stressing principles of biochemistry, physiology, and toxicology rather than those of ecology. Major emphasis is placed on plant natural products.

225. Terrestrial Field Ecology (4) III. Karban
Seminar—1 hour; laboratory—12 hours. Prerequisite: introductory ecology and introductory statistics. A field course conducted over spring break and four weekends at Bodega Bay, emphasizing student projects. Ecological hypothesis testing, data gathering, analysis, and written and oral presentation of results will be stressed. (Same course as Ecology 225.)

230. Advanced Biological Control (3) I. Ehler
Lecture—2 hours; discussion—1 hour. Prerequisite: course 135. Advanced treatment of current topics in biological control of arthropod pests and weeds. Offered in alternate years.

253. Advanced Medical Entomology (3) III. The Staff

Lecture—2 hours; discussion—1 hour. Prerequisite: one upper division course in entomology (other than course 153) and one course in microbiology: course 153 strongly recommended. An analysis of several arthropod-borne human diseases with emphasis on the relationships of the biology of the vector to the ecology of the disease. Discussion includes demonstration of vectors and techniques. Offered in alternate years.

290. Special Topics in Entomology (1-4) I, II, III. The Staff (Chairperson in charge)

Seminar—1-4 hours. Prerequisite: consent of instructor.

291. Seminar in Medical Entomology (2) I. McClelland, Washino, Eldridge

Seminar—2 hours. Prerequisite: course 153. Discussions of parasitology, ecology and epidemiology related to vectors of pathogens causing disease in man and animals.

292. Seminar in Insect Physiology (2) I. Duffey, Hammock, Maeda

Seminar—2 hours. Prerequisite: course 102. Critical examination of areas of current interest to insect physiology and biochemistry.

293. Seminar in Systematic Entomology (2) III. Ward, Thorp, Kimsey

Seminar—2 hours. Prerequisite: course 103. Selected topics in systematics and evolution are presented and discussed. Some topics may be illustrated by laboratory sessions.

294. Seminar in Insect Ecology (2) III. Carey, Ehler, Karban

Seminar—2 hours. Prerequisite: a general ecology course. Discussions of advanced topics in ecology with emphasis on analysis of factors influencing the distribution and abundance of insects. Includes consideration of applications of basic theory as in biological control and related approaches.

295. Seminar in Agricultural Entomology (2) II. Granett, Parrella, Rosenheim

Seminar—2 hours. Prerequisite: course 110. Discussion of advanced topics relating to the principles of pest insect population management.

296. Seminar in Bee Biology (2) I. Thorp, Page, Peng

Seminar—2 hours. Prerequisite: course 119 or the equivalent. Discussions of behavior, ecology, management, and general biology of bees (Apoidea) with emphasis on the honeybee.

297. Seminar in Insect Behavior (2) III. Dingle

Seminar—2 hours. Prerequisite: a course in animal behavior. Review and critical analysis of contemporary advances in insect behavior, especially interpretation and description of observations, physiological mechanisms, functional kinds of behavior, and the application of general principles to the solution of problems in the laboratory and field.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III, summer. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

404. Grantsmanship (2) I. Granett, Duffey
Lecture—1 hour; 15-20 page research proposal required. Prerequisite: graduate standing; research

experience. Approved for graduate degree credit. Develops in students an awareness of options and strategies in writing research proposals. Students write a full-length research proposal.

Environmental and Resource Sciences

(College of Agricultural and Environmental Sciences)

Faculty. See under departments of Agricultural Economics, Agronomy and Range Science, and Land, Air and Water Resources.

The Major Program

The environmental and resource sciences major is a program for study of the physical, chemical and biological features of environmental resources, and the economical and social considerations associated with their use, conservation, protection, and management. Students who choose this major include those with an interest in careers associated with environmental resource utilization and management, as well as those pursuing post baccalaureate, academic, or professional training.

The Program. The curriculum for the major provides flexibility in meeting individual needs, interests, and objectives. At the same time, certain courses are required in the basic physical and biological sciences areas. An upper division general environmental resource sciences course, a resource economics course, and a specified number of units of resource-oriented courses are required for all students in the major. Resource-oriented courses shall be selected in consultation and with approval of the student's adviser. Considerable care should be taken to ensure effective utilization of the flexibility of the major, and to meet individual academic and career objectives. Areas of specialization are achieved through selection of one of the options within the major.

Internships and Career Alternatives. Positions now held by graduates in environmental and resource sciences are quite varied, but many are employed as resource analysts and planners as well as technical and environmental specialists with government agencies, municipalities, and private firms. A significant proportion of graduates undertake further studies leading to advanced degrees in resources, the environment, and related fields.

B.S. Major Requirements:

For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. (Courses shown without parentheses are required.)

	UNITS
Written/Oral Expression	11-12
See College requirement	
English (English 1, 3, or 20)	7-8
Rhetoric (Rhetoric and Communication 1)	4
Preparatory Subject Matter	53-63
Biological sciences (Biological Sciences 1A-1B-1C)	15
Chemistry (Chemistry 2A-2B)	10
Environmental quality (Environmental Toxicology 10)	3
Geology (Geology 1 or 50)	3
Mathematics (Mathematics 16A-16B† or 21A-21B)	6-8
Microcomputer skills, computer programming (Agricultural Systems and Environment 21 and 121, Engineering 5, Computer Science Engineering 10, 15)	6
Physics (Physics 1A-1B† or 5A-5B-5C—see option requirements)	6-12

Statistics (Statistics 13)	4
†Students are encouraged to take the advanced series—consult with your adviser.	
Breadth/General Education	24
Satisfaction of General Education requirements; additional units in social sciences and humanities to total 24 units	
Depth Subject Matter	24-27
Written expression (in addition to college requirement), (English 103D, 103E, 104)	3
Agricultural Economics 147 or 148	3-4
Soil Science 100	4
Hydrologic Science 100	5
Social-political awareness (Environmental Studies 161, 179; Environmental Toxicology 138, Geography 161, Geology 134, Wildlife and Fisheries Biology 154)	3-4
Plant or animal ecology (Botany 117, Entomology 104, Environmental Studies 100, Plant Science 101, Zoology 125)	3-4
Areas of Specialization (choose one)	
Air Resource Option	34
<i>Directed towards a general understanding of the atmosphere as a finite resource and of environmental problems currently faced by humankind. The option provides a broad understanding of the physical and chemical properties of the atmosphere, including the impacts of air pollution and global climate change. Employment opportunities include positions within federal, state, and county agencies concerned with environmental quality and with private companies. (Preparatory physics options Physics 5A-5B required.)</i>	
Atmospheric Science 30, 60, 110, 124, 133	17
Atmospheric Science 192 (Internship)	3
Environmental Studies 110	4
Environmental and Resource Science 131	3
Geography 116	4
Additional electives (Environmental Studies 116, Geography 115, Environmental and Resource Science 103)	3
Unrestricted electives (to total 180)	19-34
Environmental Resources Option	39-43
<i>For the general study of the physical, chemical and biological features of renewable natural resources, and the economic and social considerations associated with their use, protection and management. For those who plan careers associated with resource utilization and mangament, and those pursuing post baccalaureate, academic, or professional training.</i>	
Statistics (Agricultural Systems and Environment 120, Environmental Studies 123)	3-4
Environmental and Resource Science 192	3
Upper division resource-oriented courses chosen in consultation and with approval of advisor	18-24
Environmental and Resource Science upper division breadth courses (choose from three of the following areas)	9-12
Agricultural economics, agronomy and range science, animal science, botany, agricultural engineering, civil and environmental engineering, economics, environmental horticulture, environmental studies, environmental toxicology, geography, geology, plant science, range management, environmental and resource science, soil science, water science, wildlife and fisheries biology, and zoology.	
Unrestricted electives (to total 180)	10-29
Energy Systems Option	28
<i>Provides a general, semi-technical appreciation of the roles and importance of energy conversion systems to industrial societies and the associated environmental (physical-biological) impacts of existing technologies.</i>	

<i>Appropriate preparation for careers with utilities, monitoring and environmental quality agencies.</i>	
Environmental Studies 1, 126, 167, 169 (select three courses)	12
Atmospheric Science 131	4
Environmental and Resource Science 3	3
Environmental and Resource Science 103	3
Environmental and Resource Science 192 (Internship)	3
Unrestricted Electives	25-40
Land and Water Management Option	24-28
<i>A broad background in management of soil and water resources in both natural and agricultural ecosystems. Emphasis on analysis of soils and plants for estimating crop nutrient requirements and principles of irrigation and drainage of agricultural land. Appropriate for those seeking employment with state and federal agencies or with agroindustry.</i>	
Soil Science 109, 118	7
Hydrologic Science 103, 104	8
Soil Science 192 or Hydrologic Science 192 (Internship)	3
Additional Soil Science or Hydrologic Science courses selected with adviser's approval	6-10
Unrestricted Electives	25-44
Hydrobiology Option	32-35
<i>Training in the biological aspects of water resources focusing on the understanding and protection of polluted and unpolluted water systems; the structure, function, and principles of aquatic systems. Graduates may seek employment with state and federal agencies such as Water Resources Control Board, Department of Fish and Game, Department of Water Resources, or consulting firms concerned with environmental impacts.</i>	
Hydrologic Science 122, 122L	5
Botany 118, 150	3-5
Entomology 116	5
Wildlife and Fisheries Biology 120, 120L	4
Water Science 180	3
Water Science 192 (Internship)	3
Additional electives (Environmental Studies 123, 151 and 151L, Environmental Toxicology 101, Hydrologic Science 41, 141, 150, Wildlife and Fisheries Biology 153)	6-10
Unrestricted Electives (to total 180)	18-36
Total Units for the Major	180
Related Courses. For courses that are related to this major see course listings for Agricultural Economics, Agricultural Systems and Environment, Animal Science, Entomology, Environmental Biology and Management, Environmental Studies, Environmental Toxicology, Evolution and Ecology, Geography, Geology, Plant Biology, Range Management, Soil Science, Water Science, Wildlife and Fisheries Biology.	
Major Adviser. J. Stasulat (201 South Hall).	
Advising Center for the major is located in 122 Hoagland Hall (916-752-1669).	
Courses in Environmental and Resource Sciences (ERS)	
<i>Questions pertaining to the following courses should be directed to the instructor or to the Resource Sciences Teaching Center, 122 Hoagland Hall (916-752-1669).</i>	
Lower Division Courses	
*2. Concepts in Forestry (3) II. Zasoski Lecture—2 hours; discussion—1 hour. Prerequisite: Biological Sciences 10 or Chemistry 10. Introduction to the physical, biological and ecological factors that give the forest its character and examination of social and economic factors governing forest management. General Education credit: Nature and Environment.	
3. Energy and the Environment (3) I. McBean Lecture—3 hours. Prerequisite: Biological Sciences 10, Chemistry 10, Physics 10 or one equivalent	

*Course not offered this academic year.

course. Energy resources, their global distribution and the social, economic, political and environmental factors influencing utilization. Roles of hydro, solar, biomass, geothermal, nuclear and fossil fuels in meeting California's energy requirements. General Education credit with concurrent enrollment in course 3G: Nature and Environment.

3G. Energy and the Environment Discussion (1) I, II. Discussion—1 hour. Prerequisite: course 3 concurrently. Critical, methodical, and analytical study of issues dealing with energy-environment interactions. General Education credit with concurrent enrollment in course 3: Nature and Environment.

3L. Energy, Society and Environment Laboratory (2) I. McBean
Discussion—1 hour; laboratory—3 hours; Saturday field trips. Prerequisite: course 3. Field trips to examine nuclear, solar, fossil fuel, hydroelectric, wind, geothermal and cogeneration energy conversion facilities.

10. California: The State (3) II. The Staff
Lecture—3 hours. Prerequisite: introductory geology or geography recommended. Introduction to geomorphology, physiography and natural resources of California. Interrelated impacts of terrain, climate and resources upon essential human activities. Analysis of the fundamental concepts and methods of inquiry guiding existing resource management policies. General Education credit with concurrent enrollment in course 10G: Contemporary Societies.

10G. California: The State (Discussion) (1) II. The Staff
Discussion—1 hour; brief essays. Prerequisite: course 10 concurrently. Small group discussion of topics assigned for course 10. Preparation and discussion of essays. General Education credit with concurrent enrollment in course 10: Contemporary Societies.

92. Resource Sciences Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in resource sciences. Internship supervised by a member of the faculty. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

103. Renewable Energy Resource (3) II. Flocchini
Lecture—3 hours. Prerequisite: course 3. Characteristics of solar energy; energy balance of structures; analysis of systems for heating water and air; air conditioning systems; electricity from the sun; biomass conversion; wind power.

121. Water and Society (3) I. Silk
Lecture—2 hours; discussion—1 hour. Prerequisite: Physics 10 or Geology 1. The role of water as an essential natural resource in contemporary society. Aspects of the scientific method, including descriptions of natural phenomena, measurement techniques, and predictive models. Supply and use of water for municipalities, agriculture, industry, wildlife and recreation. General Education credit: Nature and Environment.

131. Air as a Resource (3) II. Flocchini
Lecture—2 hours; discussion—1 hour. Prerequisite: Chemistry 10. Degradation of the atmospheric resource, historical aspects and effects of air pollution examined. Evaluation of primary gaseous and particulate pollutants and discussion of their impact. General Education credit: Nature and Environment.

192. Resource Sciences Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in resource sciences. Internship supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Environmental Biology and Management

(College of Agricultural and Environmental Sciences)

Faculty

See under the Division of Environmental Studies.

The Major Program

The environmental biology and management major offers an education in the basic natural sciences, especially ecology, together with a set of management and public policy analysis courses. Students completing the program will understand the scientific basis for environmental decision making, and the legal, economic, and political issues involved in management of the environment in the United States and worldwide.

The Program. Courses in chemistry, physics, mathematics, biology, and earth sciences form the foundation of the curriculum; these are then tied together by courses in ecology, computing, statistics, and other methods courses give the student basic quantitative research skills. Economics, political science, and techniques of quantitative management offerings dominate the management and public policy requirements.

A moderate degree of specialization is permitted in three upper division options. Students in the *Conservation Biology and Management* option take courses in conservation biology, genetics, evolution and biogeography, resource economics, environmental policy making, quantitative analysis and field experience. The emphasis of this option is the study of biological diversity and the natural and human processes that control it. Key areas of the option include the design of nature reserves, the management of small populations of endangered species, environmental law, policy and economics. Students in the *Environmental Biology* option take course work in population ecology, physiology, and other biological specialties, as well as quantitative analysis. Students in the *Environmental Management* option take courses in recreation, resource economics, planning and public policy, and, especially, quantitative management techniques. This option emphasizes the management of public lands and natural resources in wildland and rural areas. Practical courses in field level planning and management are featured. Students interested in urban problems and/or legislative approaches should examine the Environmental Policy Analysis and Planning major.

Career Alternatives. The major prepares students to enter careers in management of natural resources and public lands, as well as basic ecological research. Students interested in professional schools, e.g., medicine, should consult an adviser early to plan for their special requirements, such as organic chemistry. Graduates who chose the Environmental Biology option are prepared for graduate or professional training and, eventually, careers working for public agencies and private firms specializing in environmental quality, natural resources, or ecological research. Graduates with the Environmental Management option are prepared for jobs in public agencies at the federal, state, or local levels.

B.S. Major Requirements:

(The usual courses taken to satisfy requirements are shown in parentheses. Equal or more comprehensive courses may be taken with the adviser's written

approval. Courses shown without parentheses are required.) Students will be required to plan their course selection with their adviser.

UNITS

English Composition Requirement.....6-15
See College requirement0-8
Additional English (English 102 concurrently with Environmental Studies 1).....3
Oral expression (Rhetoric and Communication 1 or Dramatic Art 10)3-4

Preparatory Subject Matter.....49-54

Biological sciences (Biological Sciences 1A, 1B, 1C).....15
Chemistry (Chemistry 2A-2B or 2AH-2BH) ..10
Computer science (Agricultural Science and Management 21, or Computer Science Engineering 10, 15, or 30)3-4
Environmental analysis (Environmental Studies 1 or 30; choose Environmental Studies 1 if Environmental Management option is selected)3-4
Policy analysis (Political Science 1, or Economics 1A; choose Economics 1A if Environmental Management option is selected)4-5
Mathematics (Mathematics 16A-16B or 21A-21B).....6-8
Physics (Physics 5A-5B or 9A-9B)8

Breadth/General Education.....12-24

Satisfaction of General Education requirement to include 12 units of humanities and/or Civilization and Culture12-24

Depth Subject Matter26-32

(These units must be taken for a letter grade attaining an overall grade-point average of 2.000 or higher.)

Ecology (Select one of Botany 117, Environmental Studies 100, Wildlife and Fisheries Biology 151, Zoology 125).....3-4

Survey of environmental science, Environmental Studies 110.....4

Physical processes in the environment (Select two course from: Atmospheric Science 120, Environmental Studies 150A, Environmental and Resource Sciences 131, Geology 134, 153, 154, Soil Science 100, Water Science 100, 141)6-8

Environmental Policy (Select one course from: Environmental Studies 161, 162, 163, 166, 171, 179; Agricultural Economics 147, 175, 176).....3-4
(Choose Agricultural Economics if Environmental Management option is selected.)

Management of Public Lands, Environmental Studies 1724

Mathematics and/or Statistics (Select one course from: Mathematics 16C, 21C, 22A, 22B, Agricultural Science and Management 150, Statistics 102 OR upper division mathematics, computing or statistics. Environmental Management students should enroll in Agricultural Science and Management 150 or Statistics 1023-4
Research methods (Environmental Studies 123, 128, 178, Wildlife and Fisheries Biology 100. Management students should enroll in Environmental Studies 1783-5

Areas of Specialization.....25-38

Conservation Biology and Management Option

Conservation biology, Wildlife and Fisheries Biology 1544
Genetics, Biological Sciences 1014

Evolution and biogeography. Choose one from: Entomology 147, Evolution and Ecology 100, 102, 138, 144, 147, 149, Geography 173, Geology 1073-4

Resource economics, Agricultural Economics 176 or Environmental Studies 1753
(Students must select a course which was not taken in "Depth Subject Matter.")

Environmental policy making. Choose one from: Agricultural Economics 147, Environmental Studies 161, 166, 171, 172, Geography 161.....3-4
(Students must select a course which was not taken in "Depth Subject Matter.")

Quantitative analysis, Environmental Studies 121 or Wildlife and Fisheries Biology 122.....4

Field experience. Choose from Environmental Studies 123, 124, 151L, 155L, Wildlife and Fisheries Biology 100, 102.....3-10
(Students may select Biological Sciences 122 or a course at an approved field station or an off-campus field biology research site.)

Environmental Biology Option

Behavioral ecology (Choose one from: Anthropology 154A, Entomology 104, Evolution and Ecology 137, Neurobiology, Physiology and Behavior 155, Psychology 150, Wildlife and Fisheries Biology 140).....3-5

Evolution and genetics (Choose one from: Biological Sciences 101, Evolution and Ecology 100, Geology 107).....3-4

Quantitative analysis (Mathematics 22A-22B, upper division mathematics or statistics).....6-8

Taxonomy, including laboratory experience (Entomology 103, Evolution and Ecology 112-112L, 133, Plant Biology 102, 108, 116, Wildlife and Fisheries Biology 110, 111, 111L, 120).....4-8

Physiology, including laboratory experience. Choose from: Entomology 102, Environmental Studies 129, 129L, Physiology 110, Plant Biology 111, Wildlife and Fisheries Biology 121.....3-5

Advanced environmental biology. Choose two courses from the following: Avian Sciences 100, Environmental Studies 121, 151, 151L, 150B, 150C, 155, 155L, Evolution and Ecology 144, 149, Geography 173, Plant Biology 101, 102, 117, Water Science 122, 122L, Wildlife and Fisheries Biology 100, 120, 122, 130.....6-8

Environmental Management Option

Resource policy evaluation, Environmental Studies 162.....4

Microeconomics, Economics 100 or 104 or Agricultural Economics 100A.....5

Bureaucratic policy making, Environmental Studies 166, or Political Science 182.....4

Environmental management, Environmental Studies 179.....3

Statistical analysis, Agricultural Economics 106 or Sociology 106, or Statistics 108..4

Management of a natural resource, choose two courses from one of the following three groups.....6-8

Animal Resources: Range Science 135, or Wildlife and Fisheries Biology 110, 111, 120, 122, 151, 154, or Environmental and Resource Science 101, or Environmental Studies 123.

Forest and Rangeland Resources: Environmental and Resource Science 2, or Range Science 133, 134.

Air, Water, and Soil Resources: Environmental and Resource Science 131, or Water Science 41, 103, 122, 141, or Geography 162, or Soil Science 118, or Environmental Studies 151 and 151L, 155 and 155L.

Unrestricted Electives.....20-62

Total Units for the Degree.....180

Major Adviser: J.F. Quinn (Environmental Studies).

†Most of these courses require one or two additional chemistry or basic physiology courses as prerequisites. Plan a sequence in consultation with adviser.

Minor Program Requirements:

The faculty for Environmental Biology and Management offers a minor in Recreation for students in Landscape Architecture desiring to specialize in recreation area design; Physical Education, Psychology, Sociology, Human Development, and Applied Behavioral Sciences students wishing to work in educational and therapeutic recreation; Environmental Policy Analysis and Planning students seeking careers in public recreation policy analysis and management; Agricultural and Managerial Economics students wishing to go into the administration of commercial recreation enterprises; and those students in Plant Science interested in park landscape construction and maintenance.

UNITS

Recreation.....18-20

Resource economics, (Agricultural Economics 147, 176, Economics 123).....3-4

Urban recreation programs, (Environmental Planning and Management 134, Physical Education 150).....3-4

Recreation policy analysis, Environmental Studies 162.....4

Recreation administration, (Agricultural Economics 112, Applied Behavioral Science 163, 170, Political Science 183, 189.....4

Internship in Recreation Management, Environmental Studies 192.....4

Minor Adviser: R. A. Johnston (Environmental Studies).

Courses in Environmental Biology and Management

Questions pertaining to courses in Environmental Biology and Management should be directed to the Environmental Biology and Management advising office, 2134 Wickson Hall. See also Environmental Planning and Management listing following Environmental Horticulture.

Environmental Design

(College of Agricultural and Environmental Sciences)

Robert Sommer, Ph.D., Chairperson of the Department

JoAnn Stabb, M.A., Associate Chair, Design

Robert L. Thayer, Jr., M.A., Associate Chair, Landscape Architecture

Department Office, 142 Walker Hall (916-752-6223)

Faculty

Richard Berteaux, B.Arch., M.S., Associate Professor

Frances Butler, M.A., Professor

Kerry J. Dawson, M.L.A., Professor

Mark Francis, M.L.A., Professor

Dolph Gotelli, M.A., Professor

Patricia Harrison, M.Arch., Assistant Professor

Janet L. Hethorn, Ph.D., Assistant Professor

Gyöngy Laky, M.A., Professor

E. Byron McCulley, B.S.L.A., Lecturer

Edward S. McNiel, M.L.A., Lecturer

Helge B. Olsen, Senior Lecturer

Patsy E. Owens, M.L.A., Assistant Professor

Susan Palmer, M.A., Lecturer

Victoria Z. Rivers, M.A.C.T., S.C.T., Professor

Barbara Shawcroft, M.F.A., Professor

Heath Schenker, M.A., Assistant Professor

Robert Sommer, Ph.D., Professor

Kathryn Sylva, M.F.A., Lecturer

JoAnn C. Stabb, M.A., Senior Lecturer

Robert L. Thayer, Jr., M.A., Professor

Emeriti Faculty

Katherine W. Rossbach, M.A., Professor Emerita

Programs of Study. See the majors in Design and Landscape Architecture.

Related Courses. See Design and Landscape Architecture course lists.

Environmental Geology

(College of Letters and Science)

The minor in Environmental Geology examines the multidisciplinary factors of geology and related earth science fields, and planning and resources oriented programs.

Students in the minor are encouraged to participate in internship programs that assist them in solidifying the Environmental Geology minor with their Geology major or other major field areas that include geologic components.

The minor is sponsored by the Department of Geology, 174 Physics/Geology.

Minor Program Requirements:

UNITS

Environmental geology.....23-25

Geology 130, 134, and 152 or Geography 106.....10

Soil Science 118.....4

Hydrologic Science 141 or Civil and Environmental Engineering 142.....3

Two courses chosen from:

Environmental Studies 160, 171, 179;

Geology 135, 154 or Geography 108;

Environmental and Resource Sciences

100; Hydrologic Science 145.....6-8

Minor adviser: Robert Twiss, Department of Geology, 397 Physics/Geology, 752-0179.

Environmental Horticulture

(College of Agricultural and Environmental Sciences)

James A. Harding, Ph.D., Chairperson of the Department

Department Office, 140 Environmental Horticulture Building (916-752-0130)

Faculty

Michael G. Barbour, Professor

Alison M. Berry, Ph.D., Associate Professor

David W. Burger, Ph.D., Associate Professor

Thomas G. Byrne, M.S., Lecturer

Don J. Durzan, Ph.D., Professor

Richard Y. Evans, Ph.D., Lecturer

Seymour M. Gold, Ph.D., Professor

James A. Harding, Ph.D., Professor

Charles E. Hess, Ph.D., Professor

J. Heinrich Lieth, Ph.D., Associate Professor

Patricia A. Lindsey, Lecturer

James D. MacDonald, Ph.D., Professor (Plant Pathology)

Carolyn Napoli, Ph.D., Assistant Professor

Michael P. Parrella, Ph.D., Professor (Entomology)

Michael S. Reid, Ph.D., Professor

Roy M. Sachs, Ph.D., Professor

Lin L. Wu, Ph.D., Professor

Emeriti Faculty

Richard W. Harris, Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award*

Anton M. Kofranek, Ph.D., Professor Emeritus

Harry C. Kohl, Jr., Ph.D., Professor Emeritus

Andrew T. Leiser, Ph.D., Professor Emeritus

John H. Madison, Jr., Ph.D., Professor Emeritus
 Jack L. Paul, Ph.D., Professor Emeritus

The Program. Students of Environmental Horticulture learn how plants improve the environment and the quality of our lives. Plants are used to revegetate and restore disturbed landscapes, control erosion, and reduce energy and water consumption. The ornamental use of plants to improve the aesthetic quality of urban and rural landscapes, recreational areas, and commercial sites is an important aspect of the study of environmental horticulture.

Students interested in Environmental Horticulture obtain a B.S. degree in Plant Science with specialized options in Floriculture/Nursery Management or Landscape Horticulture (see listings under Plant Science). Students can develop an individual major with the help of an Environmental Horticulture faculty adviser and approval of the College's Individual Major Committee. A minor in Environmental Horticulture is available to students in other majors.

Career Alternatives. Opportunities in this field include growing and/or managing plants in a variety of settings, consulting as an urban horticulturist, business ownership, working for public agencies or private landscape firms/corporations, park management and landscape contracting. Students are encouraged to develop internships on or off campus to augment their activities in the classroom and laboratory.

Related Undergraduate Programs and Graduate Study. See the undergraduate majors in Agricultural Systems and Environment, Environmental Biology and Management, and Plant Science; and for graduate study, refer to the Graduate Studies section.

Related Courses. See Plant Science.

Minor Program Requirements:

UNITS

Environmental Horticulture	22-24
Environmental Horticulture 6	3
Plant Science 109.....	4
Select one of the following courses:	
Environmental Horticulture 105.....	4
Environmental Horticulture 107.....	4
Select two of the following three courses:	
Environmental Horticulture 125.....	5
Environmental Horticulture 130.....	3
Environmental Horticulture 133.....	4
Select one of the following two courses:	
Environmental Planning and Management 110	4
Environmental Planning and Management 134	4

Minor Advisers: J.A. Harding or D.W. Burger.

Courses in Environmental Horticulture (ENH)

Lower Division Courses

1. Introduction to Environmental Horticulture/Urban Forestry (3) I. Hess

Lecture—3 hours. Introduction to the use of plants to enhance the physical, visual and social environment. The use of ecological principles in developing sustainable, low maintenance landscape systems will be presented. Career opportunities will be discussed.

6. Introduction to Environmental Plants (3) I. The Staff

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Introduction to the classification, nomenclature, and variation of environmental plants. The use of floral and vegetative characteristics and terminology to key unknown plants. Characteristics of plant groups and the development and maintenance of cultivars. Identification of 150 common landscape plants.

10. Landscape Horticulture for the Home and Community (3) III. Burger

Lecture—2 hours; discussion—1 hour. Recommended for non-majors. Influences of climate, soil, and cultural practices on the growing of turf, flowers, and herbaceous and woody plants in the landscape.

92. Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)

Internship—3–36 hours. Prerequisite: lower division standing, Biological Sciences 1C or Plant Science 2 or 10, and consent of instructor. Work experience off and on campus in flower and nursery crop production, and marketing; landscape horticulture; and park management. Internships supervised by a member of the faculty. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses

100. Urban Forestry (3) I. The Staff

Lecture—2 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1C, Agricultural Systems and Environment 2. Principles and practices of planning and managing urban vegetation. The basics of tree appraisal, natural resource inventory, and development of long-term urban forest management plans will be covered.

102. Physiological Principles in Environmental Horticulture (4) III. Sachs

Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1C. Physiological principles and processes essential to floriculture, nursery crop production, turf culture and landscape horticulture. Emphasis on the control of vegetative and reproductive development for a broad species range in greenhouse and extensive landscape environments.

105. Taxonomy and Ecology of Ornamental Plants (4) III. Harding

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 6 or Biological Sciences 1C. Classification and identification of exotic and native species used in the western landscape. Emphasis on plant adaptations to environmental variation, patterns of morphological diversity and phyletic relationships of plants that are important factors in the human environment.

107. Herbaceous Environmental Plants (4) III. Harding

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: introductory course in environmental plants (course 6) or in plant taxonomy (Botany 108). Evolutionary relationships, hybridization, selection and cultural uses of herbaceous, environmental plant materials with emphasis on family characteristics and genetic and environmental differences. Plants are identified with the use of taxonomic keys.

120. Management of Container Soils (3) I. The Staff

Lecture—2 hours; laboratory—3 hours. Prerequisite: Soil Science 100. Appropriate use of sand, mineral soil, and amendments to formulate container soils. Management of container soils emphasizing irrigation, salinity control, and fertilizer practices.

125. Greenhouse and Nursery Crop Production (5) II. Napoli, Lieth

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Plant Science 2. Principles and techniques necessary for the greenhouse and nursery production of ornamental crops.

130. Turfgrass and Amenity Grassland Utilization and Management (4) III. Wu

Lecture—2 hours; discussion—1 hour; laboratory—2 hours. Prerequisite: Biological Sciences 10 or Plant Science 2. Utilization and management of amenity and landscape grassland systems. Emphasis on biology of grass species, ecology and culture practice of sports turf and landscape grassland systems, social and environmental benefits, environmental impact, and integrated management systems.

133. Woody Plants in the Landscape: Growth, Ecology and Management (4) II. Berry

Lecture—2 hours; laboratory—2 hours; discussion—1 hour. Prerequisite: Biological Sciences 1C or the equivalent preparation in plant biology. Principles and practices of managing trees and shrubs in the urban landscape and other managed environments. Topics include woody plant form; growth response and adaptation; tree management in relation to soil, moisture, climate; plant problems.

192. Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)

Internship—3–36 hours. Prerequisite: completion of 84 units, two upper-division courses in Environmental Horticulture appropriate for the internship, and consent of instructor. Work experience off and on campus in flower production and marketing, nursery crop production and marketing; landscape horticulture; and park management. Internships supervised by a member of the faculty. (P/NP grading only.)

197T. Tutoring in Environmental Horticulture (1-4) I, II, III. The Staff

Hours and duties will vary depending on course tutored. Prerequisite: upper division standing, completed course or the equivalent being tutored, and consent of instructor. Leading discussion sections, conducting laboratory exercises or proctoring in individualized instruction format classes under faculty guidance. Weekly conferences on subject matter and instructional techniques. May be repeated once for credit if different course is tutored.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: 3 units of upper division work in environmental horticulture; consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: 3 units of upper division work in environmental horticulture; consent of instructor. (P/NP grading only.)

Graduate Courses

220. Tree Biotechnology (2) II. Durzan

Lecture—2 hours. Prerequisite: Bachelors or Masters degree in a plant science discipline (botany, plant physiology, genetics, horticulture, related fields). Develop understanding of basic principles of biotechnology of woody perennials. Cell and tissue culture methods and current process control problems are emphasized. Recombinant DNA methods covered where appropriate. Develop analytical evaluation skills. Review trends in commercialization.

241. Analysis of Horticultural Problems (3) III. The Staff

Lecture—1 hour; laboratory—6 hours. Prerequisite: a B.S. degree (or the equivalent) in Plant Science or consent of instructor. Diagnosis of ornamental plant disorders. Emphasis on distinguishing among disorders caused by soil, water, insects, pathogens, chemical agents, climatic conditions and cultural practices using visual symptoms and circumstances for determining probable cause and laboratory methods for confirmation. Offered in alternate years.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour. Research conference conducted by departmental faculty to discuss design, philosophy, and interpretation of ongoing specific research areas which include plant morphogenesis, floriculture, greenhouse production and modeling, landscape plant ecology, arboriculture, turf culture, post harvest, plant breeding, etc. (S/U grading only.)

290C. Research Group Conference (1) I, II, III.

Berry, Lieth, Napoli, Reid, Sachs, Wu
 Discussion—1 hour. Prerequisite: students in a plant science graduate program. Research conference conducted by departmental faculty to discuss design, philosophy, and interpretation of ongoing specific research areas which includes plant morphogenesis, floriculture, greenhouse production, landscape plant ecology, arboriculture, turf culture, post harvest, and plant breeding related to environmental horticulture. (S/U grading only.)

297T. Tutoring in Environmental Horticulture (1-4) I, II, III. The Staff (Chairperson in charge)

Tutoring—4 to 8 hours; discussion—1 hour. Prerequisite: graduate student standing; completion of course to be tutored (or the equivalent) and/or consent of instructor. Leading discussion sessions, conducting laboratory exercises, and lecturing in Environmental Horticulture classes under faculty guidance. Weekly conference on subject matter and instructional tech-

niques. May be repeated for credit by tutoring in different courses.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

Prerequisite: graduate standing. (S/U grading only.)

Courses in Environmental Planning and Management (ENP)

Questions pertaining to the following courses should be directed to the instructor.

Upper Division Courses

110. Urban and Regional Planning (4) II. Gold (Environmental Horticulture)

Lecture—3 hours; discussion—1 hour; one Saturday field trip. Prerequisite: upper division standing. The history, nature, scope, and significance of planning in America with emphasis on basic definitions and concepts, the planning process and comprehensive plan, significant problems and potentials, design alternatives, the future, innovation, and the profession.

134. Recreation Planning (4) III. Gold

Lecture—3 hours; discussion—1 hour; one Saturday field trip. Prerequisite: courses 110, 116. Description of basic concepts, principles, techniques and methods used to prepare park, recreation, and open space plans for urban environments.

Environmental Planning and Management

See **Environmental Biology and Management; and Environmental Horticulture**

Environmental Policy Analysis and Planning

(College of Agricultural and Environmental Sciences)

The Major Program

The major in environmental policy analysis and planning develops an understanding of governmental policy-making and skills for analyzing policy in fields related to environmental quality.

Students interested in this major should apply to the Exploratory Program. Applications to the major are accepted from Exploratory students on a continuing basis.

The Program. This major provides students with a general background in the natural sciences relevant to environmental policy. It also provides sufficient training in mathematics, statistics, and research methodology to quantitatively analyze environmental problems and policy options. A strong background in policy analysis, including the evaluation of policy alternatives and the study of factors affecting policy formulation and implementation is included. In addition, students are encouraged to develop substantive knowledge in a specific field of environmental policy, such as urban and regional planning, water pollution control, or energy.

Career Alternatives. Environmental policy analysis and planning graduates are prepared for employment in public agencies, consulting firms, and businesses concerned with environmental affairs. The major is

also excellent preparation for students who want to go on to graduate work in law, planning, public policy, or management.

B.S. Major Requirements:

(Courses in parentheses are those normally taken. Very similar or more difficult courses may be taken with the approval of your adviser. Courses shown without parentheses are required.)

	UNITS
English Composition Requirement	10-11
See College requirement	0-8
Additional English (English 102 concurrently with Environmental Studies 1).....	3
Preparatory Subject Matter	51-58
Biological sciences (Biological Sciences 1A or 10).....	4-5
Chemistry (Chemistry 2A, 2B).....	10
Computer science (Agricultural Systems and Environment 21, Engineering 5, Computer Science Engineering 10, 30).....	3-4
Economic principles (Economics 1A, 1B).....	10
Environmental science/agriculture (Animal Science 1, Biological Sciences 1B, Geography 1, Geology 1, Hydrologic Science 100, 104, Plant Science 10, Soil Science 100).....	3-5
Environmental studies (Environmental Studies 1).....	4
Mathematics (Mathematics 16A-16B or 21A-21B).....	6-8
Physics (Physics 1A).....	3
Political science (Political Science 1).....	4
Statistics (Statistics 13, 32).....	3-4
Breadth/General Education	6-24
Satisfaction of General Education requirement	6-24
Depth Subject Matter	37-40
(Students must take these units on a letter grade basis, and must attain an overall grade-point average of 2.000 or higher in the Depth Subject Matter courses.)	
Core Courses	
Environmental Studies 160.....	4
Environmental Studies 161, 173, or Water Science 150	3-4
Environmental Studies 166.....	4
Environmental Studies 168A.....	5
Environmental Studies 171 or 179	3-4
Environmental Studies 110.....	4
Environmental Studies 164.....	4
Research Methods	
Environmental Studies 178; or Sociology 103.....	4
Sociology 106 or Agricultural Economics 106 or Statistics 108.....	3-4
Economic Analysis	
Economics 100, 104, or Agricultural Economics 100A.....	4-5
Agricultural Economics 176	3
Areas of Specialization (choose one)	17-23
Advanced Policy Analysis Option	
Political institutions (Political Science 102, 105, 108, 155, Environmental Studies 162).....	4
Political behavior (Political Science 164, 165, 170).....	4
Science policy (Environmental Studies 165).....	4
Policy evaluation research (Environmental Studies 168B).....	4
Policy evaluation (Civil and Environmental Engineering 153, 160, Agricultural Economics	3-4
City and Regional Planning Option	
Urban design (Art History 168, Environmental Biology and Management 110; Landscape Architecture 40 recommended).....	3-4
Urban geography (Geography 155, 156).....	4
Transportation planning (Civil and Environmental Engineering 160).....	3

Environmental impact assessment (Soil Science 118, Environmental Studies 179).....3-4
 Urban economics (Economics 125).....4
 Urban politics (Political Science 102, 100) ..4
 (Enroll for Environmental Studies 173 for law requirement under Depth Subject Matter above.)

Energy Policy Option

Environmental health (Environmental Studies 126, Environmental Toxicology 101).....4
 Nuclear hazards (Environmental Studies 115).....3
 Energy technology (Engineering 160, 162) ..4
 Solar energy (Environmental and Resource Sciences 103).....3
 Economics of energy (Environmental Studies 175).....4
 Energy policy (Environmental Studies 167).....4

Environmental Science Option

Students choosing the Environmental Science area of specialization must consult with a faculty adviser to identify an emphasis within this specialization and to select suitable courses. Possible areas of emphasis are: biological conservation, pollutants in the environment, ecology, planning in the presence of environmental hazards. If you are considering this area of specialization, please contact the major adviser as soon as possible.

Recreation Policy Option

Internship in Recreation Management, Environmental Studies 192
 4 || Public Land Management, Environmental Studies 172 | 4 |
Urban recreation programs (Environmental Biology and Management 134, Physical Education 150).....	3-4
Recreation policy analysis, Environmental Studies 162	4
Recreation administration (Agricultural Economics 112, Applied Behavioral Science 163, 170, Political Science 183, 189).....	4

Transportation Planning Option

Urban structure (Geography 155, 156, Economics 125).....4
 Transportation planning (Civil and Environmental Engineering 160).....3
 Transportation engineering and analysis (Civil and Environmental Engineering 161, Environmental Studies 168B)
 3-4 || Energy policy (Environmental Studies 167, Engineering 160)..... | 4 |
| Air quality (Environmental and Resource Sciences 131) | 3 |
| Energy and environmental aspects of transportation (Environmental Studies 163)..... | 3 |

Water Quality Option

Water resource management (Environmental Studies 126, Environmental Toxicology 101, Geography 162).....4
 Water pollution (Hydrologic Science 21, Soil Science 120).....2-3
 Freshwater systems (Hydrologic Science 122, Environmental Studies 151).....3-4
 Field and laboratory methods (Hydrologic Science 122L, Environmental Studies 151L).....2-3
 Water chemistry (Hydrologic Science 103, 142).....3-4
 Hydrology (Hydrologic Science 141).....3
 (Enroll in Hydrologic Science 150 for law requirement under Depth Subject Matter above.)

Unrestricted Electives.....24-59

Total Units for the Degree.....180

Major Adviser. S.I. Schwartz (*Environmental Studies*).

*Course not offered this academic year.

Minor Program Requirements

The faculty for environmental policy analysis and planning offers the following two minors. The Energy Policy minor is for students from any major seeking basic training in energy technology, impacts and policy analysis methods applied to energy systems. The second minor is intended for natural and social science students desiring basic training in policy analysis theory and methods.

	UNITS
Energy Policy	18-19
Preparation: Economics 1A; basic course in political science.	
Environmental and Resource Sciences 3 or Engineering 160	3-4
Environmental Studies 126 or Environmental Toxicology 101	4
Environmental and Resource Sciences 103 or Environmental Studies 115	3
Environmental Studies 169	4
Environmental Studies 167 or Political Science 171	4

	UNITS
Environmental Policy Analysis	23-24
Preparation: Economics 1A; basic course in political science.	
Environmental Studies 110, 160, 161, 166, 168A	20
Environmental Studies 171 or 179	3-4

Minor Adviser. S.I. Schwartz (*Environmental Studies*).

Environmental Studies

(Intercollege Division)

Alan M. Hastings, Ph.D., Chairperson of the Division

Division Office, 2132 Wickson Hall (916-752-3026)

Faculty

Theodore C. Foin, Jr., Ph.D., Professor
 Charles R. Goldman, Ph.D., Professor
 Susan P. Harrison, Ph.D., Assistant Professor
 Alan M. Hastings, Ph.D., Professor
 Robert A. Johnston, M.S., Professor
 Benjamin S. Orlove, Ph.D., Professor
 James F. Quinn, Ph.D., Associate Professor
 Eliska Rejmankova, Ph.D., Assistant Professor
 Peter J. Richerson, Ph.D., Professor
 Paul A. Sabatier, Ph.D., Professor
 Thomas W. Schoener, Ph.D., Professor (*Evolution and Ecology*)
 Christine Schonewald-Cox, Ph.D., Assistant Adjunct Professor
 Seymour I. Schwartz, Ph.D., Professor
 Daniel Sperling, Ph.D., Professor (*Environmental Studies, Civil and Environmental Engineering*)
 Geoffrey A. Wandesforde-Smith, Ph.D., Associate Professor (*Environmental Studies, Political Science*)
 James E. Wilen, Ph.D., Professor (*Environmental Studies, Agricultural Economics*)

Emeriti Faculty

William J. Hamilton III, Ph.D., Professor Emeritus

The Program of Study

The intercollege Division of Environmental Studies is a teaching and research unit offering courses, workshops, and directed group study classes that focus on the complex problems of human-environment relations. The Division offers Bachelor of Science degrees in Environmental Biology and Management and in Environmental Policy Analysis and Planning. Courses in Environmental Studies also supplement major programs in a wide variety of established disciplines, although highly motivated undergraduates who find

existing majors unsuited to their educational objectives are encouraged to contact the Chairperson and faculty of the Division regarding individual majors in the College of Agricultural and Environmental Sciences (see Individual Major in the Programs and Courses section).

Current Information. Through its continuing contacts with many other departments and teaching divisions on the campus, the Division develops each year a variety of special courses and workshops that cannot be listed here. Students are advised to check with the Division Office and with the expanded course description handbook of the College of Agricultural and Environmental Sciences for up-to-date information about courses.

Graduate Study. The faculty of the Division offers graduate instruction through the M.S. and Ph.D. degree programs of the Graduate Group in Ecology, as well as through the graduate programs of the disciplines with which they are associated, such as agricultural economics, zoology, sociology, political science, civil engineering, and anthropology. Further information about graduate programs in ecology should be obtained from the Chairperson of the Graduate Group in Ecology.

Graduate Adviser. T.C. Foin (*Ecology*).

Courses in Environmental Studies (EST)

Lower Division Courses

1. Environmental Analysis (4) II. Quinn, Moyle
 Lecture—3 hours; discussion—1 hour. Prerequisite: English 1; English 102, Economics 1A, 1B, Biological Sciences 1A, and Political Science 1 recommended. Analysis of the biological, physical, and social interactions which constitute environmental problems, such as food production, energy development and conservation, pollution, and the conservation of natural environments. Emphasis on analysis of problems and the consequences of proposed solutions.

10. Introduction to Environmental Studies (4) I. Wandesforde-Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: elementary biology recommended. Survey of the importance of ecology and systems behavior for man-environment relationships and management problems. Resources, environmental quality, urban dynamics, environmental perception, and conservation are covered. Includes several integrative case studies, and features individual reading in environmental problems. Not open for credit to those who have had course 1. General Education credit: Contemporary Societies.

30. The Global Ecosystem (3) III. Richerson
 Lecture—3 hours; 1 one-day field trip. Prerequisite: Biological Sciences 10 or Geography 1 or Anthropology 2. The interaction of climate and biotic adaptation and the production of ecological systems. The limits and opportunities for human use of different natural environments, and human utilization of the earth's biotic resources. General Education credit with concurrent enrollment in course 30G: Nature and Environment.

30G. The Global Ecosystem: Laboratory/Discussion (2) III. Richerson
 Laboratory/discussion—3 hours. Prerequisite: course 30 concurrently. Presents natural history skills in plant and animal identification, soils, and geology. Emphasis on the diverse organisms and habitats of Northern California. General Education credit with concurrent enrollment in course 30: Nature and Environment.

92. Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)
 Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internship supervised by member of the faculty. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

100. General Ecology (4) I. Harrison
 Lecture—3 hours; discussion—1 hour. Prerequisite: elementary biology (including botanical and zoological elements); elementary calculus. Ecological principles of biological systems, emphasizing populations and ecosystems. Principles of growth, regulation, distribution, structure, energetics, and mineral cycles related to the evolution of biological systems and applications to selected human ecological problems.

101. Human Ecology (4) II. Richerson, Mulder
 Lecture—3 hours; discussion—1 hour. Prerequisite: one course from course 30, Anthropology 1, 2, Genetics 10, or the equivalent. Critical variables in the processes that relate humans and their environment. Emphasis on the biological, cultural, social, and psychological forces which encourage stability or change in human ecological relationships. (Same course as Anthropology 101.) General Education credit: Contemporary Societies.

(a) *Environmental Science*

110. Principles of Environmental Science (4) II.

The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Physics 1A or 5A, Mathematics 16B or 21B, and Biological Sciences 1A. Application of physical and chemical principles, ecological concepts, and systems approach to policy analysis of atmospheric environments, freshwater and marine environments, land use, energy supplies and technology, and other resources.

115. Bioenvironmental Consequences of Nuclear Technology (3) III. Raabe

Lecture—3 hours; field trip to nuclear power station. Prerequisite: a course in biology. Biospheric implications of radio-nuclide and thermal effluents generated by nuclear technology. Hazards evaluation based on predictions of the most sensitive physiological response. Offered in alternate years.

116. The Oceans (3) I. Spero; II. Cowen

Lecture—3 hours. Introductory survey of the marine environment; oceanic physical phenomena, chemical constituents, geological history, the sea's biota, and utilization of marine resources. (Same course as Geology 116.) General Education credit with concurrent enrollment in course 116G: Nature and Environment.

116G. The Oceans: Discussion (2) I. Spero; II. Cowen

Discussion—2 hours. Prerequisite: course 116/Geology 116 concurrently. Scientific method applied to the discovery of the processes, biota, and history of the oceans. Group discussion and preparation of papers on related topics. General Education credit with concurrent enrollment in course 116: Nature and Environment. (Same course as Geology 116G).

(b) *Ecological Analysis*

121. Population Ecology (4) II. Hastings
 Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1B, 1C, Mathematics 16A-16B. Development of exponential and logistic growth models for plant and animal populations, analysis of age structure and genetic structure, analysis of competition and predator-prey systems. Emphasis is on developing models and using them to make predictions and solve problems. Offered in alternate years.

123. Introduction to Field and Laboratory Methods in Ecology (4) III. The Staff

Lecture—2 hours; laboratory—6 hours; two weekend field trips. Prerequisite: Statistics 13, course 100 (may be taken concurrently), or the equivalent. Course will introduce students to methods used for collecting ecological data in field and laboratory situations. Methods used by population ecologists and community ecologists are included and emphasis will be placed on experimental design, scientific writing, and data analysis.

124. Marine and Coastal Field Ecology (10) Extracurricular summer. Chow

Lecture—6 hours; discussion—4 hours; seminar—1 hour; laboratory—18 hours (Summer Session I). Prerequisite: Biological Sciences 1A; Statistics 13; course 100. Full-time study at Bodega Marine Laboratory. Intensive lecture-laboratory-field study of current ecological theory and problems with emphasis on marine populations and communities; techniques and evaluation of quantitative field research.

126. Environmental and Occupational Epidemiology (4) I. Beaumont

Lecture—3 hours; discussion—1 hour. Prerequisite: introductory course in statistics and upper division standing. Methods and contemporary issues in environmental and occupational epidemiology. Effects of carcinogens, reproductive hazards, lifestyle factors, air and water pollution, infectious agents, and other hazards on human populations. Discussion of epidemiologic study designs, biases, and risk assessment.

128. Analysis and Simulation of Complex Systems (3) III. Foin

Lecture—3 hours. Prerequisite: Mathematics 16B or 21B; Statistics 102; upper division standing in the biological or social sciences. Analysis of systems and construction of simulation models of ecological and socioeconomic systems using DYNAMO; evaluation of models. Logical and scientific reasoning is stressed.

128L. Modeling Complex Systems (3) III. Foin

Lecture—1 hour; laboratory—3 hours; discussion—1 hour. Prerequisite: course 128 concurrently. Simulation modeling using DYNAMO. Students complete a series of exercises from model formulation to model experiments and develop a term project of their own choosing.

***129. Physical Biology** (3) III. The Staff

Lecture—3 hours. Prerequisite: Chemistry 2B, Physics 1B, and Biological Sciences 1A and 1B. Comparative and evolutionary study of organismic responses and adaptations to the physical and chemical environment. Body size and metabolism, gas and nutrient exchange, thermoregulation, biomechanics, locomotion, and selected topics in current research.

***129L. Physiological Ecology Laboratory** (3) III.

The Staff
Laboratory—6 hours. Prerequisite: course 129 (may be taken concurrently) or the equivalent. Methods for monitoring physical variables in aquatic and terrestrial environments and animal responses to them. Water balance, respiration, and thermoregulation are demonstrated and a broadly comparative approach is considered. Enrollment limited.

(c) Cultural Ecology

133. Cultural Ecology (4) III. Orlove

Lecture—3 hours; discussion—1 hour. Comparative survey of the interaction between diverse human cultural systems and the environment. Primary emphasis given to people in rural and relatively undeveloped environments as a basis for interpreting more complex environments. (Same course as Anthropology 133.) General Education credit: Contemporary Societies.

(d) Aquatic Ecosystems Analysis

150A. Physical and Chemical Oceanography (4) I. McClain, Spero

Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies/Geology 116, Physics 9B, Mathematics 22C, Chemistry 1C; or upper division standing in a natural science and consent of instructor. Physical and chemical properties of seawater, fluid dynamics, air-sea interaction, currents, waves, tides, mixing, major oceanic geo-chemical cycles. (Same course as Geology 150A.)

150B. Geological Oceanography (3) II. McClain (Geology)

Lecture—3 hours. Prerequisite: Geology 50 or 116. Introduction to the origin and geologic evolution of ocean basins. Composition and structure of oceanic crust; marine volcanism; and deposition of marine sediments. Interpretation of geologic history of the

ocean floor in terms of sea-floor spreading theory. (Same course as Geology 150B.)

150C. Biological Oceanography (3) III. The Staff
Lecture—3 hours. Prerequisite: Biological Sciences 1A and a course in general ecology, or consent of instructor. Survey of the ecology of major marine habitats including intertidal, shelf benthic, deep-sea and plankton communities. Existing knowledge and contemporary issues in research. Portion of course will be devoted to man's use of and impact on the ocean. (Same course as Geology 150C.) Offered in alternate years.

151. Limnology (4) III. C. Goldman

Lecture—3 hours; discussion—1 hour; special project. Prerequisite: Biological Sciences 1A and junior standing. The biology and productivity of inland waters with emphasis on the physical and chemical environment.

151L. Limnology Laboratory (3) III. C. Goldman
Laboratory—6 hours; two weekend field trips. Prerequisite: course 151 (may be taken concurrently); junior, senior, or graduate standing. Limnological studies of lakes, streams, and reservoirs with interpretation of aquatic ecology.

155. Wetland Ecology (3) I. Rejmankova

Lecture—3 hours. Prerequisite: course 100 or Botany 117; course 110 or 151 recommended. Introduction to wetland ecology. The structure and function of major wetland types and principles that are common to wetlands and that distinguish them from terrestrial and aquatic ecosystems.

155L. Wetland Ecology Laboratory (3) I.

Rejmankova
Lecture—1 hour; laboratory—6 hours; fieldwork—two 1-day weekend field trips. Prerequisite: course 155 required (may be taken concurrently). Modern and classic techniques in wetland field ecology. Emphasis on sampling procedures, vegetation analysis, laboratory analytical procedures, and examples of successful wetland restoration techniques.

(e) Environmental Policy Analysis

160. Environmental Decision Making (4) II.

Sabatier
Lecture—3 hours; discussion—1 hour. Prerequisite: Political Science 1, Economics 1A, intermediate statistics, course 1 and course 166 or Political Science 182; upper division standing or consent of instructor. Alternative models of environmental policymaking, and application to case studies of decision making in the U.S. and California.

161. Environmental Law (4) II. Wandesforde-Smith
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing and one course in environmental science (course 1, 10, 110, Biological Sciences 1A, Environmental Toxicology 10, or Resource Sciences 100); English 1 and Political Science 1 recommended. Introduction for non-Law School students to some of the principal issues in environmental law and the judicial interpretation of some important environmental statutes, e.g., NEPA. General Education credit: Contemporary Societies.

162. Recreation Policy Analysis (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; Agricultural Economics 147 or 176; Environmental Biology and Management 127. Introduction to major issues and evaluative techniques in the analysis of outdoor recreation policy. Principles of political science and economics are applied to the analysis of recreation demand and provision, and the resolution of conflicts between recreation and other uses. Offered in alternate years.

163. Energy and Environmental Aspects of Transportation (3) II. Sperling

Lecture—3 hours. Prerequisite: Civil Engineering 160 recommended. Application of engineering, economic, and system planning concepts. Analysis of energy, air quality, and other selected environmental attributes of transportation technologies. Investigation of strategies for reducing pollution and petroleum consumption in light of institutional and political constraints. (Same course as Civil Engineering 163.)

164. Ethical Issues in Environmental Policy (4) III.

Sabatier
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 160, 168A; seniors only in Environmental Policy Analysis and Planning or by consent of instructor. Basic modes of ethical reasoning and criteria of distributive justice applied to selected topics in environmental policy-making.

165. Science, Experts and Public Policy (4) II.

Craig
Lecture—4 hours. Prerequisite: upper division standing in the social or biological sciences; course 160 or Political Science 108 recommended. Analysis of factors affecting the influence of scientists, planners, and other experts in policymaking. Several cases and controversies will be examined.

166. Policy-Making in Natural Resource Agencies (4) I. Sabatier

Lecture—3 hours; discussion—1 hour. Prerequisite: Political Science 1, Economics 1A, Statistics 13. Analysis of factors affecting decision-making within administrative agencies responsible for managing natural resources, such as the Forest Service and EPA. Emphasizes critical examination of written materials. General Education credit: Contemporary Societies.

167. Energy Policy (4) I. Johnston

Lecture—4 hours. Prerequisite: Resource Sciences 3 or Engineering 160; course 160 or Political Science 101, 107, or 109. Overview of U.S. energy policy; policy analysis, philosophy and methods; major policy issues, such as renewable vs. nonrenewable; and applied studies of power plants, solar residential, and state policy options. Offered in alternate years.

168A. Methods of Environmental Policy Evaluation (5) I. Schwartz

Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: Statistics 13; Economics 100 or Agricultural Economics 100A; Mathematics 16B or 21B; and course 1; upper division standing. Evaluation of alternatives for solution of complex environmental problems; impact analysis, benefit-cost analysis, distributional analysis, decision making under uncertainty, and multiobjective evaluation.

168B. Methods of Environmental Policy Analysis (4) III. Schwartz

Lecture—3 hours; discussion—1 hour. Prerequisite: course 168A. Continuation of course 168A, with emphasis on examination of the literature for applications of research and evaluation techniques to problems of transportation, air and water pollution, land use, and energy policy. Students will apply the methods and concepts by means of a major project.

(f) Environmental Planning

171. Environmental Planning (4) III. Johnston
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; a course in social science and a course in environmental science. Laws, institutions, design and analysis methods, and means of implementation of plans for land use, air and water quality, transportation, and energy are examined. Theoretical and practical readings are used. Political and technical problems common to all planning processes emphasized.

172. Public Lands Management (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A. Investigation of alternative approaches to public lands management by Federal and state agencies. The role each agency's legislation plays in determining the range of resource allocations.

173. Public Mechanisms for Controlling Land Use (4) III. Johnston

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1, English 1, Political Science 1, and Economics 1A. Politics and administration of zoning, subdivision and building regulation and open space preservation, constitutional and legal bases for controls; community and political factors influencing legislation and administration of controls; and the relative effectiveness of specific controls in channeling urban growth.

175. Natural Resource Economics (3) II. Wilen

Lecture—3 hours. Prerequisite: course 100B or Economics 100 or the equivalent. Economic concepts

and policy issues associated with natural resources, renewable resources (ground water, forests, fisheries and wildlife populations), and non-renewable resources (minerals and energy resources, soil). (Same course as Agricultural Economics 175.)

178. Applied Research Methods (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Statistics 103 or Sociology 106 or the equivalent. Research methods for analysis of urban and regional land use, transportation, and environmental problems. Survey research and other data collection techniques; demographic analysis; basic forecasting, air quality, and transportation models. Collection, interpretation, and critical evaluation of data.

179. Environmental Impact Reporting (3) I. Johnston
Lecture—2 hours; discussion—1 hour. Prerequisite: upper division standing; Biological Sciences 1A; one course from the following: course 1, 10, 110, Environmental Toxicology 10, or Resource Sciences 100. Methods of analysis used in environmental impact reporting. Emphasis on effective writing; review and management of impact reports in the context of rational democratic planning systems.

(g) Other Courses

190. Workshops on Environmental Problems (1-8) I, II, III. The Staff
Laboratory—2-16 hours. Prerequisite: consent of instructor. Workshops featuring empirical analyses of contemporary environmental problems by multidisciplinary student teams. Guided by faculty and lay professionals, the teams seek to develop an integrated view of a problem and outline a series of alternative solutions. Open to all upper division and graduate students on application. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Department Chair person in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

212A. Environmental Policy Analysis (4) III. Sabatier
Lecture—3 hours; discussion—1 hour; seminar paper. Prerequisite: course in public policy (e.g. Political Science 107 or 108), course in bureaucratic policy making (e.g. course 166 or Political Science 181) and course in intermediate statistics (e.g. Sociology 106 or Agricultural Economics 106). An examination of selected topics in the formulation and implementation of environmental policy, with a principal emphasis on conceptual and methodological issues. Offered in alternate years. (Same course as Ecology 212A.)

212B. Environmental Policy Analysis: Evaluation (4) II. Schwartz
Lecture—1 hour; discussion—1 hour; seminar—2 hours; independent evaluation project. Prerequisite: Economics 100 (or the equivalent), course 168A (or the equivalent course in policy analysis or resource economics), intermediate level statistics (e.g. Sociology 106 or Agricultural Economics 106). Examination of recent research and practice in the evaluation of environmentally related policies, programs, and plans. Ex ante and ex post evaluation will be studied. Offered in alternate years. (Same course as Ecology 212B.)

***228. Advanced Simulation Modeling** (3) III. Foin
Lecture—2 hours; discussion—1 hour. Prerequisite: courses 128-128L; Statistics 108 or Agricultural Economics 106. Advanced techniques in simulation modeling; optimization and simulation, dynamic parameter estimation, linear models, error propagation,

and sensitivity testing. Latter half of course will introduce model evaluation in ecological and social system models.

***228L. Modeling Laboratory** (3) III. Foin
Laboratory—2 hours; modeling and computing—7 hours. Prerequisite: courses 128-128L; course 228 concurrently. Continuation of course 128L. Students expected to complete series of exercises on advanced topics in modeling and a term project based on their graduate research.

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing. (S/U grading only.)

Environmental Toxicology

(College of Agricultural and Environmental Sciences)
Takayuki Shibamoto, Ph.D., Chairperson of the Department

Department Office, 4138 Meyer Hall (916-752-1142)

Faculty

Michael S. Denison, Ph.D., Assistant Professor
Bruce D. Hammock, Ph.D., Professor
(*Environmental Toxicology, Entomology*)
Dennis P. H. Hsieh, Sc.D., Professor
Theodore L. Hullar, Ph.D., Professor
Fumio Matsumura, Ph.D., Professor
Marion G. Miller, Ph.D., Associate Professor
Clayton A. Reece, M.S., Lecturer
Robert H. Rice, Ph.D., Professor
James N. Seiber, Ph.D., Professor
Takayuki Shibamoto, Ph.D., Professor
Michael W. Stimmann, Ph.D., Lecturer
Barry W. Wilson, Ph.D., Professor (*Environmental Toxicology, Avian Sciences*)
Dorothy E. Woolley, Ph.D., Professor (*Environmental Toxicology, Neurobiology, Physiology and Behavior*)

Emeriti Faculty

Richard G. Bureau, Ph.D., Professor Emeritus
Donald G. Crosby, Ph.D., Professor Emeritus
Wendell W. Kilgore, Ph.D., Professor Emeritus
Ming-yu Li, Ph.D., Lecturer Emeritus
Wray W. Winterlin, M.S., Lecturer Emeritus

The Major Program

Students in environmental toxicology study toxic substances which are found in our personal, occupational, community, and global environments. What these substances are, where they are distributed and what happens to them, how they work, and detecting and analyzing these substances are the central focus of study. A special concern is with human-made toxicants such as pesticides, industrial chemicals, food additives, and environmental pollutants; but toxic substances that occur naturally in the environment (including heavy metals and toxins produced by animals, plants, molds, and bacteria) are also of concern.

The Program. The study of environmental toxicology draws heavily from preparatory courses in biology, chemistry, mathematics, and physics. The major offers courses outlining the chemical, biological, and legal aspects of environmental toxicology (legislation concerning pollution, pesticides, food additives, and consumer protection) as well as providing in-depth treatment of different groups of toxic substances. Students can specialize in any of several areas of environmental toxicology—for example chemical analysis, environmental monitoring, animal toxicology, or environmental health and safety—by choosing electives in these areas.

Internships and Career Alternatives. Research positions in both university and private laboratories, as well as with governmental regulatory agencies in nearby Sacramento, are examples of current internship openings for environmental toxicology majors. Approximately half of the undergraduates completing the environmental toxicology program elect to go on for advanced degrees in toxicology, pharmacology, public health, or the medical sciences. Others with the B.S. degree have found jobs with government agencies, universities, in industry, research and consulting firms, and with laboratories. Those students who emphasize the physical sciences in their study of toxicants would qualify for positions in residue analysis, environmental monitoring, and forensic toxicology. Those emphasizing the biological sciences would qualify for similar positions in animal toxicology, environmental health and safety, and pest control.

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses where possible; equivalent or more comprehensive courses may be substituted with adviser's approval. *Courses shown without parentheses are required.*)

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	61-70
Biological sciences (Biological Sciences 1A, 1B, 1C)	15
Chemistry (Chemistry 2A-2B-2C, or 2AH-2BH-2CH and 118A-118B-118C or 128A-128B-128C)	20-24
Computer science (Agricultural Systems and Environment 21)	3
Environmental sciences (Environmental Toxicology 10 or Environmental Studies 10)	3-4
Mathematics (Mathematics 16A-16B or 21A-21B)	6-8
Physics (Physics 1A-1B or 5A-5B)	6-8
Statistics (Statistics 13 or 100)	4
Breadth/General Education	36
Satisfaction of the General Education requirement to include courses selected with adviser's approval to complement the major (courses in agricultural economics, environmental studies, political science, psychology, and sociology are particularly recommended.)	24
Additional breadth in humanities and social sciences	12
Depth Subject Matter	29-30
Genetics and/or Biochemistry (Biological Sciences 101, 102, 103)	6-7
Environmental Toxicology 101, 112A-112B, 114A-114B, 138 and (128, 130A-E, 131, 132, or 135)	23
Restricted/Other Electives	24
Electives selected for area of specialization with adviser's approval	
Unrestricted Electives	13-29
Total Units for the Degree	180

Major Adviser. R.H. Rice

Advising Center for the major, is in 4111 Meyer Hall (916-752-1042).

Minor Program Requirements:

	UNITS
Environmental Toxicology	18
Environmental Toxicology 101, 112A, 114A, 138	12
Elective courses 6 units minimum, selected from Environmental Toxicology 10, 128, 130A-E, 131, 132, 135, 190, 198 and 199 (4 units combined maximum)	6
Minor Adviser. M.G. Miller.	

Related Courses: See Atmospheric Science 149A, Environmental Studies 10, 126, 161, Hydrologic Science 21, Environmental and Resource Sciences 131, Wildlife and Fisheries Biology 153.

Graduate Study. Programs of study leading to M.S. and Ph.D. degrees are available through related Graduate Groups such as Pharmacology and Toxicology, Ecology, and Agricultural and Environmental Chemistry. For information on graduate study, contact the Advising Office or the appropriate graduate adviser. Refer also to the Graduate Studies section in this catalog.

Graduate Advisers. J.A. Last, B.W. Wilson (*Pharmacology and Toxicology*), T. Shibamoto and D.P.H. Hsieh (*Agricultural and Environmental Chemistry*).

Courses in Environmental Toxicology (ETX)

Lower Division Courses

10. Introduction to Toxicology (3) III. Hsieh
Lecture—3 hours. Prerequisite: open to science and non-science majors. Study of some natural and man-made toxic substances in personal, occupational, community, and global environments. Emphasis placed upon occurrence, properties, and effects of toxic substances. Biological and physical factors which alter fate of substances are described.

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Principles of Environmental Toxicology (3) I. Denison
Lecture—3 hours. Prerequisite: Chemistry 8B, 128B, or the equivalent; Biological Sciences 102 recommended. The fate, consequences, and assessment of toxicants in environmental and biological systems; classes of environmental toxicants discussed include pesticides, air and water pollutants, phytotoxins, mycotoxins, food-borne toxicants, and heavy metals.

112A. Toxicants in the Environment (3) II. The Staff
Lecture—3 hours. Prerequisite: course 101 or consent of instructor. Properties of toxic chemicals which influence their distribution and transformations; action of environmental forces which affect toxicant breakdown, movement, and accumulation; sources and occurrence of major classes of environmental toxicants.

112B. Toxicants in the Environment (4) III. Shibamoto
Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 5; course 112A; consent of instructor. Continuation of 112A. Toxic chemicals—primarily pollutants—in the environment; concepts and techniques of sampling, detecting, and measuring toxicants of current concern; collection, interpretation, and use of analytical data. Limited enrollment. Environmental Toxicology majors will be given preference for enrollment.

114A. Biological Effects of Toxicants (3) II. Rice
Lecture—3 hours. Prerequisite: Biological Sciences 103 (may be taken concurrently); course 101 and Physiology 110 recommended. Course designed to illustrate the biological effects of toxic substances in living organisms. Topics to be covered: fate and mechanism-of-action of representative toxins, types of effects, symptoms, and antidotes.

114B. Biological Effects of Toxicants: Experimental Approaches (4) III. Miller
Lecture/discussion—2 hours; discussion/laboratory—4 hours. Prerequisite: course 114A and consent of instructor if non-major. Illustrates basic principles of

toxicology and acquaints students with laboratory techniques for evaluating potential toxicity of chemicals. Continuation of course 114A. Limited enrollment. Environmental Toxicology majors will be given preference for enrollment.

128. Food Toxicology (3) III. Shibamoto, Gruenwedel (Food Science and Technology)
Lecture—3 hours. Prerequisite: Biological Sciences 102 and 103. Chemistry and biochemistry of toxins occurring in foods, including plant and animal toxins, intentional and unintentional food additives. The assessment of food safety and toxic hazards. (Same course as Food Science and Technology 128.)

130A-E. Selected Topics in Environmental Toxicology (3) I, II, III. The Staff (Chairperson in charge)
Lecture/discussion—3 hours. Prerequisite: consent of instructor; course 101 recommended. Selected topics of current interest in environmental toxicology. Topics will vary each time the course is offered, and will emphasize such areas as the microbiology of toxic substances, poisonous plants and animals, chemical ecology, toxic substances in food, and the safe handling of toxic substances.

131. Air Pollutants and Inhalation Toxicology (3) III. Last (Internal Medicine)
Lecture—3 hours. Prerequisite: Chemistry 8B (may be taken concurrently) or the equivalent; Biological Sciences 102 recommended. Toxicology of air pollutants in the ambient and occupational environments. Environmental fates, biological effects, air-quality criteria and standards, and pulmonary responses to these pollutants.

***132. Chromatography for Analytical Toxicology** (4) II. The Staff (Chairperson in charge)
Discussion—1 hour; laboratory—8 hours; slide demonstrations and extensive library assignments. Prerequisite: Chemistry 8B or the equivalent (may be taken concurrently); consent of instructor. Application and theory of basic chromatographic techniques such as thin-layer, gas-liquid, high-pressure liquid and column chromatography useful for analytical toxicology; residue analysis comprises one-third of course.

135. Health Risk Assessment of Toxicants (3) I. Hsieh
Lecture—3 hours. Prerequisite: course 101; course 114A recommended. Current practices of health risk assessment of environmental chemicals using toxicological principles and their application to regulatory control of these chemicals.

138. Legal Aspects of Environmental Toxicology (3) II. Stirmann
Lecture—3 hours. Prerequisite: consent of instructor; courses 10 and 101 recommended. Federal and California legislation concerning air and water pollution, pesticide use, food and feed additives, consumer protection, and occupational exposure to toxic substances; roles of Federal regulatory agencies; alternatives to governmental control.

146. Exposure and Dose Assessment (3) II. McKone, Layton
Lecture—3 hours. Prerequisite: course 112A required; course 135 recommended. The exposure component of risk assessment; specifically, the presence and/or formation of toxic substances in environmental media, their movement within and between contaminated media, and the contacts of human populations with those media.

190. Seminar (1) I. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: consent of instructor. Selected topics presented by students, faculty, or outside speakers covering current research and instructional activities within environmental toxicology. Reports and discussion concerning oral and written presentations, literature sources, and career opportunities. (P/NP grading only.)

190C. Research Group Conference (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: consent of instructor. Weekly conference of advanced research methods and the interpretation of research results. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. (P/NP grading only.)

194HA-194HB. Honors Research (3-3) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour; laboratory—6 hours. Prerequisite: senior standing, minimum GPA of 3.25, consent of instructor. Specific research project conducted under the supervision of a faculty sponsor. Experience to include experimental design, learning new techniques, data analysis and interpretation of findings. (P/NP grading only; deferred grading pending completion of sequence.)

194HC. Honors Research (3) I, II, III. The Staff (Chairperson in charge)
Laboratory—6-9 hours; discussion—1 hour. Prerequisite: senior standing, minimum GPA of 3.25, and consent of instructor. Continuation of course 194HA-194HB. (P/NP grading only.)

197T. Tutoring in Environmental Toxicology (1-5) I, II, III. The Staff (Chairperson in charge)
Hours and duties will vary depending upon course being tutored. Prerequisite: advanced standing in Environmental Toxicology, a related major, or the equivalent experience and consent of instructor. Teaching toxicology including conducting discussion groups for regular departmental courses under direct guidance of staff. May be repeated for credit up to a total of 5 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

***203. Environmental Toxicants** (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 128C (or the equivalent), or Chemistry 8B and consent of instructor. Toxic chemicals: selected topics illustrating their occurrence, structure, and the reactions underlying detection, toxicity, fate, and ecological importance. Offered in alternate years.

214. Mechanisms of Toxic Action (3) III. Hammock, Denison
Lecture—3 hours. Prerequisite: Biological Sciences 102, 103 and consent of instructor. Biochemical and physiological mechanisms underlying toxicity and detoxification.

220. Analysis of Toxicants (3) I. The Staff
Lecture—3 hours. Prerequisite: course 101 and consent of instructor; course 203 recommended. Principles of the microanalysis of toxicants. Theoretical considerations regarding separation, detection, and quantitative determination of toxicants using chemical and instrumental techniques.

220L. Analysis of Toxicants Laboratory (2) I. The Staff
Laboratory—6 hours. Prerequisite: course 220 (may be taken concurrently) and consent of instructor. Laboratory techniques for microanalysis of toxicants. Separation, detection, and quantitative determination of toxicants using chemical and instrumental methods.

228. Gas Chromatography/Mass Spectrometry of Toxic Chemicals (3) I. Reece, Shibamoto
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: course 220 and Chemistry 129C; or consent of instructor. Application of GC/MS techniques to investigate toxic chemicals. Mass spectral fragmentations and their application to the structural elucidation. Practical application of GC/MS in current research. Preference given to environmental toxicology graduate students.

234. Neurophysiological Basis of Neurotoxicology (3) I. Woolley
Lecture—3 hours. Prerequisite: Physiology 110 or the equivalent; basic understanding of neurophysiology.

Mechanisms of action at the cellular and systemic level of a number of different neurotoxins and toxicants. Examples of ways toxins may act on the nervous system and techniques for study of neurotoxicology. (Same course as Physiology 234.)

240. Ecotoxicology (3) III. Matsumura

Lecture—3 hours. Prerequisite: elementary course in toxicology and ecology or the equivalent, or consent of instructor. Principles of toxicology as applied to chemical action on natural populations, communities, and ecosystems. Physical, chemical, and biological characteristics which influence ecotoxic effects, modelling, and field research. Selected case histories are analyzed and presented in class.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Current topics in environmental toxicology. (S/U grading only.)

290C. Advanced Research Conference (1) I, II, III.

The Staff (Chairperson in charge)
Lecture/discussion—1 hour. Prerequisite: consent of instructor. Presentation and critical discussion of advanced research methods and interpretation of research results. Designed primarily for graduate students. (S/U grading only.)

297T. Tutoring in Environmental Toxicology (1-5) I, II, III.

The Staff (Chairperson in charge)
Hours and duties will vary depending upon course being tutored. Prerequisite: graduate standing in Environmental Toxicology, a related major, or the equivalent experience, and consent of instructor. Teaching toxicology including conducting discussion groups for regular departmental courses under direct guidance of staff. May be repeated for credit up to a total of 5 units. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Epidemiology (A Graduate Group)

Tim E. Carpenter, Ph.D., Chairperson of the Group
Group Office: 2102 Medical Sciences 1A
(Department of Medicine and Epidemiology)
916-752-9174

Faculty. Includes members from the Department of Medicine and Epidemiology, Division of Occupational/Environmental Health and Epidemiology, Population Health and Reproduction, Division of Statistics, and other related departments in the Schools of Medicine, Veterinary Medicine, Graduate School of Management, and the Colleges of Agricultural and Environmental Sciences and Letters and Science.

Graduate Study. The Graduate Group in Epidemiology offers programs of study and research leading to the M.S. and Ph.D. degrees. Areas of emphasis include: environmental/occupational epidemiology; infectious disease epidemiology; epidemiologic methods; health services and economics; and metabolic, nutritional, and chronic disease epidemiology. For detailed information regarding the program, address the chairperson of the group.

Graduate Advisers. M. Thurmond (Department of Medicine and Epidemiology, 752-5635), J. Beaumont (Division of Occupational/Environmental Medicine and Epidemiology, 752-8036).

Required Courses for the Program

Prerequisite Courses. Prerequisites may be taken concurrently with required courses below.

Mathematics 16A-16B or 21A-21B

Preventive Veterinary Medicine 401

Preventive Veterinary Medicine 402, 403, and 404; or Statistics 102, 106, and 108

Required Courses. These courses are required of all students in the program (M.S. and Ph.D. degrees). These requirements cannot be waived and must be met before a student's Qualifying Examination.

Epidemiology 290 or Occupational and Environmental Health 190C

Preventive Veterinary Medicine 405 or Environmental Studies 126

Preventive Veterinary Medicine 406, 407

Statistics 130A-130B or 140A-140B

Select two courses from the three groups below: (the two courses may not be from the same group)

(a) Population Health and Reproduction 202 or Statistics 144

(b) Epidemiology 222 or 223

(c) Population Health and Reproduction 203

Related Courses. For additional coursework in Epidemiology, please see Medicine and Epidemiology, Preventive Veterinary Medicine, Population Health and Reproduction, and Internal Medicine—Occupational and Environmental Health.

Courses in Epidemiology (EPI)

Graduate Courses

222. Epidemiological Modeling (3) II. Carpenter
Lecture—2 hours; laboratory—3 hours. Prerequisite: Preventive Veterinary Medicine 405. Techniques of model building and simulation of infectious diseases will be explored. Epidemiologic modeling philosophy, construction and validation will be emphasized. Offered in alternate years. (Former course Epidemiology and Preventive Medicine 222.)

223. Spatial Epidemiology (3) II. Carpenter
Lecture—2 hours; laboratory—3 hours. Prerequisite: Preventive Veterinary Medicine 405 or Environmental Studies 126 or Veterinary Medicine 409. Geographic Information Systems (GIS) and spatial statistics. Student are expected to complete a term project based on their graduate research. Offered in alternate years.

250. Introduction to Clinical Research Design and Epidemiology (1) I.

McCurdy, Hirsch
Lecture—1 hour. Prerequisite: graduate standing or medical/nursing personnel. For medical personnel who are or will be involved in medical research. Review of basics of clinical study design and analysis of clinical data. (S/U grading only.)

251. Environmental Epidemiology (3) II. Gold
Lecture—3 hours. Prerequisite: Preventive Veterinary Medicine 405 (may be taken concurrently); upper division undergraduates who have completed Environmental Studies 126; or the equivalent. Examination of the human health effects and the risk of disease from community, occupational, and personal exposure to toxic substances. Offered in alternate years.

260. Epidemiology of Chronic Diseases and Aging (3) II.

Haan
Lecture/discussion—3 hours. Overview of the epidemiology of chronic disease in old age. Topics include biology of aging, epidemiology of cardiovascular disease, neoplasms, osteoporosis and fractures, psychosocial factors and health in old age, dementias, functional status and prevention of disease.

270. Research Methods in Occupational Epidemiology (3) II.

Beaumont
Laboratory/discussion—3 hours. Prerequisite: Environmental Studies 126 or Preventive Veterinary Medicine 405; and Statistics 102 or Epidemiology and Preventive Medicine 402. Offered in alternate years.

271. Epidemiology of Diseases and Injuries in Agriculture (3) III.

Beaumont
Lecture/discussion—3 hours. Prerequisite: Environmental Studies 126 or Preventive Veterinary Medicine 405, or consent of instructor. Overview of disease and injury hazards in agriculture with emphasis on epidemiologic studies. Topics include respiratory diseases, zoonoses, occupational injuries, child injuries, suicide, stress, pesticide injuries and illnesses, infectious disease hazards, reproductive hazards, and cancer hazards. Offered in alternate years

290. Seminars in Epidemiology

(1) III. The Staff
Seminar—1 hour. Students will actively participate in presentation and discussion of ongoing or published research projects in epidemiology. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
Seminar—1-5 hours. Group study in selected areas of epidemiology.

299. Research (1-12) I, II, III. The Staff
Research in selected areas of epidemiology. (S/U grading only.)

Family Practice

See Medicine, School of

Feminist Theory and Research

Linda Morris, Ph.D., Program Director
Program Office, 271 Kerr Hall (916-752-4686)

Graduate Study. The program in Women's Studies offers courses leading to a designated emphasis in Feminist Theory and Research. The courses provide theoretical and interdisciplinary perspectives to students already preparing for the Ph.D. in one of twelve participating departments (Anthropology, Comparative Literature, Dramatic Art, Education, English, French, German, History, Italian, Psychology, Spanish, and Sociology). Students complete all requirements for the Ph.D., including the dissertation, in one of the participating departments. The additional requirements leading to the designated emphasis consist of two core courses (Women's Studies 200A and 200B) and two courses on gender, one of which must be in the student's home department. It is expected that an analysis of gender will be a central component of the student's doctoral examination and dissertation.

Graduate Adviser. Consult the Women's Studies office (916-752-4686).

Fermentation Science

(College of Agricultural and Environmental Sciences)

The Major Program

The Fermentation Science major is a program of study of the fundamental and applied sciences related to the use of microorganisms as production and processing agents. A broad interdisciplinary food-related education is offered which may be combined with specializations in enology (wine studies), brewing science, and fermentation of other foods and beverages. Industrial fermentations and waste treatments in the production of microbial cells, drugs, enzymes, hormones, solvents, acids, and vitamins are further opportunities for study.

The Program. The major in fermentation science leads to a Bachelor of Science degree. Most of the instruction for the major is done in the Department of Viticulture and Enology and in the Department of Food Science and Technology. Students also take courses in chemistry, biochemistry, microbiology, genetics, and computer science. Electives often include additional courses in sensory science, management and viticulture.

Career Alternatives. Graduates qualify for supervisory, technical, production, product development, quality control, research, sales, or executive positions in the food, beverage, and allied industries, in the fermentation industries, and in governmental agencies. Students who choose to continue in graduate study have done so in such areas as food science-ontology, microbiology, agricultural chemistry, and biochemistry.

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirement are shown in parentheses where possible. Equivalent or more comprehensive courses will be accepted.)

UNITS

English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	59-66
Biochemistry (Biological Sciences 102, 103)	6
Biology (Biological Sciences 1A)	5
Chemistry (Chemistry 2A-2B-2C; and 8A-8B or 128A-128B, 129A)	21-25
Computer science (Agricultural Systems and Environment 21, Computer Science Engineering 10, 30, or Engineering 5)	3-4
Mathematics (Mathematics 16A-16B or 21A-21B)	6-8
Microbiology (Microbiology 102-102L)	6
Physics (Physics 5A, and 5B or 5C)	8
Statistics, including analysis of variance (Agricultural Systems and Environment 120 or Statistics 106)	4
Breadth/General Education	24
Satisfaction of General Education requirement (in "Civilization and Culture" and/or "Contemporary Societies") plus additional course work in social sciences and humanities or others as approved by adviser to total 24 units.	
Depth Subject Matter	40
Choose from:	
Chemistry 107A, 107B, 108, 130	
Chemical Engineering 161, 206	
Epidemiology and Preventive Medicine 150 (or Food Science and Technology 104)	
Food Science and Technology 102A, 102B, 104, 104L, 108, 109, 110A, 110B, 128, 150, 150L, 205, 235, 250, 250L	
Biological Sciences 101	
Microbiology 105, 130A, 130B, 130L, 250	
Viticulture and Enology 3, 123, 124, 125, 126, 127, 128, 135, 140, 186, 190X, 219, 235 (no variable-unit 190, 192, 199, 299 courses allowed toward depth requirement)	
(Courses in depth subject matter may not be taken on the P/NP grading basis.	
Overall GPA in depth subject matter must be 2.0 or greater)	
Restricted Electives	28
Selected according to student's educational goals and upon approval by adviser.	
Only 6 units of 192 or 6 units of 190, 198, 199, 290, or 298 may be counted; or a total of 8 units of these courses combined.	
Unrestricted Electives	14-23
Total Units for the Degree	180

Major Adviser. A.C. Noble.

Graduate Study. Refer to the Graduate Studies degree programs in Agricultural and Environmental Chemistry, Biochemistry, Chemical Engineering, Food Science, Genetics, Microbiology.

Fiber and Polymer Science

(College of Agricultural and Environmental Sciences)

Faculty

See Textiles and Clothing.

The Major Program

The fiber and polymer science major is concerned with the physical, chemical, and structural properties of fibers and polymers and how these relate to fiber and polymer performance and end-use.

The Program. All students in this major are required to take a common core of course work in chemistry, physics, and mathematics, and depth subject matter in fiber and polymer science, organic and physical chemistry, and technical writing. In the restricted electives, the student is expected to select from courses from areas such as computer science and mathematics, chemistry, marketing and management, material and advanced fiber and polymer science, and textiles.

Career Alternatives. The major prepares the student for a career in a wide range of industries in the areas of research and development, technical marketing and management, production, quality control, and science teaching (on completion of an additional year in the teaching credential program). The companies employing Fiber and Polymer Science graduates are in the fiber, polymer, absorbent product, textile and/or chemical business. Graduates are prepared to enter the graduate program in textiles or agricultural and environmental chemistry with a specialization in fiber and polymer chemistry, and fiber and polymer science programs at other universities.

B.S. Major Requirements:

(For convenience in program planning, the usual courses taken to satisfy the requirement are shown in parentheses where possible. Equivalent or more comprehensive courses will be accepted.)

UNITS

English Composition Requirement	7-12
See College requirement	
Rhetoric 1	4
Additional English (English 104)	3
Preparatory Subject Matter	52-55
Chemistry (Chemistry 2A-2B-2C)	15
Computer science (Computer Science Engineering 10)	4
Mathematics (Mathematics 16A, 16B, 16C or 21A, 21B, 21C)	9-12
Physics (Physics 5A, 5B, 5C or 9A, 9B, 9C)	12
Statistics (Statistics 13 or Agricultural Systems and Environment 120)	4
Textiles and clothing (Textiles and Clothing 6 and 8 or Engineering 45)	8
Breadth/General Education	6-24
Satisfaction of General Education requirement; See advising office for breadth requirement.	
Depth Subject Matter	37
Textiles Science: Textiles and Clothing 163, 163L, 180A, 180B,	8
Fiber and Polymer Science 100, 150, 161, 161L	10
Chemistry (Chemistry 128A, 128B, 128C, 129A, 129B, 110A and 110C or 107A and 107B)	19
Restricted Electives	30
Select courses from the following:	
<i>Computer Science and Mathematics:</i>	
Agricultural Systems and Environment 21; Engineering 5; Applied Science Engineering 115, 116; Food Science and Technology 156; Mathematics 22A, 22B	
<i>Chemistry:</i>	

Chemistry 108, 111, 115, 120, 121, 124A, 124B, 124C, 130, 131, 140

Marketing/Management:

Agricultural Economics 100A, 100B, 113, 136, 157, Economics 1A, 1B, Statistics 103

Material and Advanced Fiber/Polymer Science:

Aeronautical Science Engineering 137, Engineering 104A, 104B, Textiles and Clothing 250A-F, 290, 293

Textiles:

Textiles and Clothing 162, 162L, 164, 165, 171, 173, 174

Unrestricted Electives

Total Units for the Degree

Major Adviser. Y.L. Hsieh (*Textiles and Clothing*).

Advising Center for the major is located in 129 Everson Hall (916-752-4417).

Minor Program Requirements:

UNITS

Fiber and Polymer Science

Textiles and Clothing 6 or Engineering 45

Courses selected from the following:

Fiber and Polymer Science 100, 150, 161, 161L; and

Textiles and Clothing 163 and 163L or 180A and 180B

Minor Adviser. Y.L. Hsieh

Courses in Fiber and Polymer Science (FPS)

Upper Division Courses

100. Principles of Polymer Materials Science (3) II. Zeronian

Lecture—3 hours. Prerequisite: Chemistry 2A-2B; Chemistry 8A-8B or Engineering 45; introductory physics. The basic principles of polymer science are presented including polymer structure and synthesis; polymerization mechanisms, polymer classes, properties, and reactions; polymer morphology, rheology, and characterization; polymer processing. (Same course as Engineering: Materials Science 147.)

110. Plastics in Society and the Environment (4)

III. Needles

Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 10 or introductory course in physical sciences. Basic concepts and methodologies in the study of plastics. Formation, classification, structure, properties, processing, and formulation. Their application to societal needs, and their impact on society and the environment. General Education credit: Nature and Environment.

150. Polymer Syntheses and Reactions (3) III.

Hsieh

Lecture—3 hours. Prerequisite: Chemistry 128B or 8B, and Chemistry 107A. Organic and physical chemistry aspects of polymer syntheses and reactions including polymerization mechanisms, kinetics and thermodynamics for major types of organic high polymers.

***161. Structure and Properties of Fibers** (3) I.

Zeronian

Lecture—3 hours. Prerequisite: Textiles and Clothing 6 and Chemistry 8B. The structure, properties and reactions of natural- and man-made fibers; the relations between molecular structure of fibers and their physical properties; interactions of fibers and detergents. Offered in alternate years.

***161L. Textile Chemical Analysis Laboratory** (1) I.

Zeronian

Laboratory—3 hours. Prerequisite: course 161 (may be taken concurrently). Laboratory methods and procedures employed in qualitative and quantitative analysis of textile fibers and auxiliaries. Offered in alternate years.

Fisheries

See Animal Science; and Wildlife and Fisheries Biology

Food Biochemistry

(College of Agricultural and Environmental Sciences)

The Major Program

The major in food biochemistry stresses the principles of chemistry and biochemistry as related to constituents of foods and the changes which occur in the constituents before and during processing and during storage. Particular emphasis is placed on the role of and changes in the carbohydrates, lipids, proteins, enzymes, and nucleic acids and their effect on the quality attributes of foods.

The Program. The food biochemistry curriculum stresses a strong background in chemistry, physics, mathematics, and biology at the lower-division level. At the upper-division level students take specialized courses in food science and technology and advanced biochemistry and nutrition. Through the appropriate choice of electives, students may emphasize certain research areas such as nutrition, food processing, or toxicology.

Career Alternatives. The major employment options for a food biochemistry graduate are in research and development at large food industry units; in laboratory-related employment in quality assurance, new food technology, and food analysis; or in any position requiring knowledge of biochemical techniques, such as in clinical laboratories. The major offers excellent preparation for graduate study in areas such as food science, nutrition, biochemistry, and environmental toxicology. Food biochemistry has also been chosen as a pre-professional major by students interested in medical, veterinary, or dental school.

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

UNITS

English Composition Requirement0-8
See College English requirement

Preparatory Subject Matter74-78
Biochemistry (Biological Sciences 102, 103)7
Biology (Biological Sciences 1A)5
Chemistry (Chemistry 2A-2B-2C or 2AH-2BH-2CH; 128A-128B-128C, 129A; 107A-107B or 110A-110B)32
Mathematics, (Mathematics 16A-16B-16C or 21A-21B-21C)9-12
Microbiology (Microbiology 102, 102L)6
Physics (Physics 5A-5B-5C or 9A-9B-9C) ..12
Other (one course from Computer Science Engineering 10, 30, Engineering 5, Mathematics 22A, 22B, 22C, Statistics 13, Agricultural Systems and Environment 120)3-4

Breadth/General Education24
Satisfaction of General Education requirement24

Depth Subject Matter30
Food Science and Technology (to include Food Science and Technology 103, 104, 104L, 110A)25
Biochemistry (Food Science and Technology 123, 123L)5

Restricted Electives24
At least one upper division biochemistry course, other than Biological Sciences 102, 103, or Molecular and Cellular Biology 120L. One nutrition course other than Nutrition 10. Remaining courses can be selected from biochemistry, physiology, environmental toxicology, genetics, public health, microbiology or other subjects related to Food Science24

Unrestricted Electives16-28
Total Units for the Degree180

Major Adviser. G.M. Smith (*Food Science and Technology*).

Graduate Study. Refer to the Graduate Studies section in this catalog.

Food Science

(College of Agricultural and Environmental Sciences)

The Major Program

Food science applies chemical, physical, biological, engineering, and social sciences to processing, preservation, development, packaging, storage, evaluation, identity and utilization of foods.

The Program. Students majoring in food science spend the first two years of study developing the scientific and general background necessary for upper division study. The science courses include chemistry, biology, physics, and mathematics. General background is provided by course offerings in the social science/humanities area and by optional courses in introductory food science. At the upper division level, students take courses in nutrition, food microbiology, food chemistry, food analysis, food commodities, food processing, food engineering, and may choose to specialize in one of five career-oriented options. Students enrolled in the program are eligible for various scholarships, including, for three of the options, scholarships from the Institute of Food Technologists.

Career Alternatives. Opportunities for employment include positions in the food and allied industries, local, state, and federal government agencies, and educational and research institutions. Graduate study for the food science student may lead to the M.S. or Ph.D. degree in food science, or in related fields such as agricultural chemistry, biochemistry, microbiology, and nutrition.

Five career-oriented options are available in the major. The *Food Technology* option provides a broad exposure to food chemistry, food microbiology, food engineering and food processing. Students find positions in quality assurance, product development, and food processing in the food industry.

The *Food Business and Management* option allows students to integrate study of the science and technology of food with that of business and economics in a unique program. Students prepare for positions of management in small food companies, and research and development-oriented marketing or technical sales opportunities in corporate food industries.

The *Consumer Food Science* option prepares students for jobs in food product formulation, research and development-oriented marketing and sensory analysis, quality assurance, extension service, creative writing, and community service. Students who obtain the requirements for the teaching credential teach elementary or secondary school home economics.

The *Food Biology/Microbiology* option and *Food Chemistry* option are designed for students interested in research and development careers with food companies or government laboratories, in teaching and research at academic institutions, or in professional (medical, veterinary, or dental) school. The *Food Biology/Microbiology* option prepares students for graduate study and research in several areas, including

food science, biochemistry, biotechnology, microbiology, and post-harvest biology. The *Food Chemistry* option prepares students for graduate study and research in such areas as flavor chemistry, food additive chemistry, biotechnology, biochemistry and toxicology.

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses may be taken with adviser's approval. *Courses shown without parentheses are required for all options.*)

UNITS

English Composition Requirement3-11
See College requirement0-8
Additional English (English 102 with food science or related area, or English 104)3

Preparatory Subject Matter26-32
Biology (Biological Sciences 1A)5
General chemistry (Chemistry 2A-2B-2C) ...15
Organic chemistry (see option for requirement)6
Mathematics (Mathematics 16A-16B)6
Physics (see option for requirement)3
Food science and society (Food Science and Technology 1) recommended(3)
Introduction to food science and technology (Food Science and Technology 50) recommended(3)

Breadth/General Education24
Satisfaction of General Education requirement plus social science and humanities electives to total 24 units24

Depth Subject Matter29
Biochemistry (Biological Sciences 102-103)6
Food composition (Food Science and Technology 100A)3
Food composition laboratory (Food Science and Technology 101A)2
Food properties (Food Science and Technology 100B)3
Food biochemistry (Food Science and Technology 100C)3
Food microbiology (Food Science and Technology 104)3
Food science seminar (Food Science and Technology 190)1
Nutrition (see option for requirements)2-5
Statistics (Agricultural Systems and Environment 120)4
Internship (Food Science and Technology 192) recommended(3)
Special study (Food Science and Technology 199) recommended(3)
See options for additional requirements.

Select one of the following five options:

Food Technology Option

Specific course requirements57-58
Biology (Biological Sciences 1B-1C)10
Organic chemistry (Chemistry 8A-8B)6
Physics (Physics 5A-5B)8
Food engineering (Food Science and Technology 110A-110B)6
Food engineering laboratory (Applied Biological Systems Technology 110L)2
Food processing (Food Science and Technology 180)4
Food analysis (Food Science and Technology 103)5
Food microbiology laboratory (Food Science and Technology 104L)4
Nutrition (Nutrition 101 or approved substitute)4
Plant sanitation (Food Science and Technology 108)3
Project conduct (Food Science and Technology 160)2
Quality assurance (Food Science and Technology 109)3

Additional courses to be selected from a master list available from the department Advising Center15

Food Business and Management Option

Specific course requirements.....59-60

Biology (Biological Sciences 1B-1C)	10
Organic chemistry (Chemistry 8A-8B)	6
Physics (Physics 1A-1B)	8
Microeconomics (Economics 1A)	5
Business organization (Agricultural Economics 112).....	4
Marketing management (Agricultural Economics 113).....	4
Personnel management (Food Service Management 123).....	3
Quality assurance (Food Science and Technology 109)	3
Food laws and regulations (Food Science and Technology 140)	3
Food packaging (Food Science and Technology 131)	3
Introduction to food science and technology (Food Science and Technology 50)	3
Plant sanitation (Food Science and Technology 108)	3
Project conduct (Food Science and Technology 160)	2
Nutrition (Nutrition 101 or approved substitute)	4

Additional courses to be selected from a master list available from the department Advising Center12

Consumer Food Science Option

Specific course requirements.....45-46

Biology (Biological Sciences 1B-1C)	10
Organic chemistry (Chemistry 8A-8B)	6
Physics (Physics 1A-1B)	8
Food properties laboratory (Food Science and Technology 101B).....	2
Introduction to food science and technology (Food Science and Technology 50)	3
Sensory evaluation (Food Science and Technology 107)	4
The senses (Food Science and Technology 117)	4
Food product development field trip (Consumer Science 47)	1
Consumer behavior (Consumer Science 100)	3
Product development (Food Science and Technology 160)	2
Business organizations (Agricultural Economics 112).....	4

Additional courses to be selected from a master list available from the department Advising Center21

Food Biology/Microbiology Option

Specific course requirements.....53-59

Biology (Biological Sciences 1B-1C)	10
Organic chemistry (Chemistry 8A-8B or 118A-118B-118C).....	6-12
Physics (Physics 5A-5B)	8
Microbiology (Microbiology 102, 102L)	6
Food analysis (Food Science and Technology 103)	5
Food microbiology laboratory (Food Science and Technology 104L).....	4
Food engineering (Food Science and Technology 110A-110B)	6
Food processing (Food Science and Technology 180)	4
Nutrition (Nutrition 101 or approved substitute)	4

Additional courses to be selected from a master list available from the department Advising Center12-18

Food Chemistry Option

Specific course requirements.....54-59

Mathematics (Mathematics 16C)	3
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Chemistry (Biological Sciences 101 or Chemistry 124A)	3
Organic chemistry (Chemistry 118A-118B-118C or 128A-128B-128C-129L).....	11-12
Physical chemistry (Chemistry 107A-107B)	6
Physics (Physics 5A-5B-5C)	12
Food analysis (Food Science and Technology 103)	5
Food microbiology laboratory (Food Science and Technology 104L)	4
Food engineering (Food Science and Technology 110A-110B)	6
Food processing (Food Science and Technology 180)	4
Nutrition (Nutrition 101 or approved substitute)	4

Additional courses to be selected from a master list available from the department Advising Center9-16

Unrestricted Electives21-36

Total Units for the Degree180

Major Adviser. D.S. Reid (Food Science and Technology).

Advising Center for the major is located in 128 Cruess Hall.

Graduate Study. A program of study and research leading to the M.S. and Ph.D. degrees in Food Science is available (see below). For further information on graduate study, contact the graduate adviser.

Food Science (A Graduate Group)

Charles F. Shoemaker, Ph.D., Chairperson of the Group

Group Office, 109 Food Science and Technology Bldg. (916-752-1415)

Faculty. Includes members from twelve departments in the Colleges of Agricultural and Environmental Sciences and Engineering, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The interdepartmental Graduate Group in Food Science offers programs of study leading to the M.S. degree and to the Ph.D. degree. Graduate studies stress the application of the biological, chemical, physical, and behavioral sciences to the processing, preservation, quality evaluation, public health aspects, and utilization of foods. For the M.S. degree there are five areas of specialization: chemistry-biochemistry, microbiology, engineering-technology, sensory sciences, and enology. Individually designed programs are also acceptable. For the Ph.D. there are three areas of specialization: biochemistry, chemistry, and microbiology. Detailed information regarding graduate study is available through the Group Chairperson or by obtaining the *Graduate Announcement*.

Graduate Advisers. Contact Graduate Studies for the list of advisers.

Food Science and Technology

(College of Agricultural and Environmental Sciences)

Erika L. Barrett, Ph.D., Chairperson of the Department

Department Office, 126 Cruess Hall (916-752-1465)

Faculty

Everett Bandman, Ph.D., Professor

Erika L. Barrett, Ph.D., Professor

John Bruhn, Ph.D., Lecturer
Stephanie R. Dungan, Ph.D., Assistant Professor
(Food Science and Technology, Chemical Engineering)

J. Bruce German, Ph.D., Associate Professor
Dieter W. Gruenwedel, Ph.D., Professor
Norman F. Haard, Ph.D., Professor

Jerald M. Henderson, D.Eng., Professor (Food Science and Technology, Mechanical Engineering)

T. William Hutchens, Ph.D., Professor
John M. Krochta, Ph.D., Professor (Food Science and Technology, Biological and Agricultural Engineering)

Michael J. Lewis, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*

Kathryn L. McCarthy, Ph.D., Assistant Professor (Food Science and Technology, Biological and Agricultural Engineering)

Michael J. McCarthy, Ph.D., Associate Professor (Food Science and Technology, Biological and Agricultural Engineering)

R. Larry Merson, Ph.D., Professor (Food Science and Technology, Biological and Agricultural Engineering)

David M. Ogrzydzak, Ph.D., Professor
Michael A. O'Mahony, Ph.D., Professor
Chester W. Price, Ph.D., Associate Professor
Robert J. Price, Ph.D., Lecturer
David S. Reid, Ph.D., Professor
Gerald F. Russell, Ph.D., Professor
Barbara O. Schneeman, Ph.D., Professor (Food Science and Technology, Internal Medicine, Nutrition)

C.F. Shoemaker, Ph.D., Associate Professor
Elizabeth O. Shuster, Ph.D., Assistant Professor
R. Paul Singh, Ph.D., Professor (Food Science and Technology, Biological and Agricultural Engineering)

Gary M. Smith, Ph.D., Associate Professor
Aloys L. Tappel, Ph.D., Professor

Emeriti Faculty

Richard A. Bernhard, Ph.D., Professor Emeritus
Walter L. Dunkley, Ph.D., Professor Emeritus
Robert E. Feeney, Ph.D., Professor Emeritus
Walter G. Jennings, Ph.D., Professor Emeritus
Bor S. Luh, Ph.D., Professor Emeritus
George L. Marsh, M.S., Professor Emeritus
Mendel Mazelis, Ph.D., Professor Emeritus
Martin W. Miller, Ph.D., Professor Emeritus
Herman J. Phaff, Ph.D., Professor Emeritus
Thomas Richardson, Ph.D., Professor Emeritus
Howard G. Schutz, Ph.D., Professor Emeritus
Lloyd M. Smith, Ph.D., Professor Emeritus
Clarence Sterling, Ph.D., Professor Emeritus
John R. Whitaker, Ph.D., Professor Emeritus

Major Program and Graduate Study. See the majors in Food Science, and Food Biochemistry; and for graduate study, refer to the Graduate Studies section in this catalog.

Related Courses. See courses in Consumer Science, Engineering, Molecular and Cellular Biology, Nutrition, and Viticulture and Enology; Environmental Toxicology 101, Epidemiology and Preventive Medicine 150, Plant Science 112 and 112L.

Courses in Food Science and Technology (FST)

Lower Division Courses

1. Food Science and Society (3) I. Bandman, Barrett

Lecture—2 hours; discussion—1 hour. Nature and scope of world food problem; food composition; scientific and technological aspects of converting animal and plant products into a variety of prepared foods; improvement and evaluation of acceptability and nutritional value of foods. Not open for credit to students who have received credit for course 100A, 100B, or 111.

2. Introductory Food Science (3) III. Russell

Lecture—3 hours; one industrial visit to a food factory (optional). Processes by which raw agricultural com-

modities are preserved and converted into edible foods; regulation of food manufacture and the chemistry and microbiology of food that control its qualities and safety. Not open for credit to students who have received credit for any other Food Science and Technology course. General Education credit: Nature and Environment.

49. Processing Plant Studies (1) III. M. McCarthy
Discussion—1 hour; field trips—3 hours. Field trips to observe processing, distribution, quality control and regulatory control of foods and related materials.

50. Introduction to Food Science and Technology (3) II. Krochta

Lecture—2 hours; laboratory—3 hours. Prerequisite: Chemistry 2A, Biological Sciences 1A. Introduction to fruit, vegetable, dairy, seafood and meat technology. Overview of food processes used for preservation of food quality. Pilot plant exercises include food processing operations such as cheese making, canning, freezing, fermentation and dehydration of foods.

***93. Public Issues in Nutrition and Food Science** (1) II. Schneeman

Seminar—1 hour. Faculty and invited guest speakers will present topics in the area of nutrition and food science which are currently subjects of public debate. Intended as an introduction to nutrition and food science for students new to the campus. (P/NP grading only.) (Same course as Nutrition 93.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Barrett in charge)
(P/NP grading only.)

Upper Division Courses

100A. Principles of Food Composition and Properties (3) I. Russell, Dungan

Lecture—3 hours. Prerequisite: Chemistry 8A-8B. Fundamental chemical, physical, and sensory aspects of food composition as they relate to physical properties, acceptability, and nutritional value of fresh and processed foods.

100B. Principles of Food Composition and Properties (3) II. Shoemaker, Shuster

Lecture—3 hours. Prerequisite: Chemistry 8A-8B. Fundamental chemical, physical, and sensory aspects of food composition as they relate to physical properties, acceptability, and nutritional value of fresh and processed foods.

100C. Principles of Food Biochemistry (3) III. Haard

Lecture—3 hours. Prerequisite: course 100B, Biological Sciences 103 (may be taken concurrently). Principles of physiology, cell biology, and biochemistry applied to postharvest changes in edible plant and animal tissue. Importance of enzymes in food quality and their use as food processing aids. Application of recombinant DNA technology to improving food quality.

101A. Principles of Food Composition and Properties Laboratory (2) I. Shoemaker

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 100A (may be taken concurrently). Course designed to give laboratory experience with the food systems and properties described in course 100A.

101B. Principles of Food Composition and Properties Laboratory (2) II. Shoemaker

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 100B (may be taken concurrently). Course designed to give laboratory experience with the food systems and properties described in course 100B.

102A. Malting and Brewing Science (4) I. Lewis

Lecture—4 hours. Prerequisite: Biological Sciences 102, 103; senior standing recommended. The technology of the malting, brewing and fermentation processes is integrated with the chemistry, biochemistry and microbiology that determine industrial practices and product quality. Not open for credit to students who have taken Food Science and Technology 102.

102B. Practical Malting and Brewing (4) II. Lewis
Lecture/discussion—2 hours; laboratory—6 hours. Prerequisite: course 102A and analytical experience beyond Chemistry 2C, such as Viticulture and Enology 123, Food Science and Technology 103, Bio-

chemistry and Biophysics 101L or 123L. Open to seniors only in Fermentation Science or Food Science and Technology. Provides practical working knowledge of analytical methods used in malting and brewing and experience with brewing materials and processes, by analysis of samples that illustrate the range of values experienced in practice and pilot scale brewing.

102C. Advanced Malting and Brewing (4) III. Lewis
Lecture/discussion—2 hours; laboratory—6 hours.

Prerequisite: course 102B. Expands knowledge of malting and brewing processes by applying analytical methods of brewing science to experiments and exercises with brewing materials and by pilot scale brewing designed to illustrate the bases for understanding this complex biological process.

102D. Malting and Brewing Colloquium (2-4) I, II, III. Lewis

Lecture/discussion—2 hours; term paper. Prerequisite: fall quarter—courses 102A, 110A; winter and spring quarters—courses 102B, 110B. Open to seniors in Fermentation Science and Food Science and Technology only. Provides detailed interpretation and extended discussion of issues in brewing science at a level suitable for professionals in the industry and gives frequent practice with written essays and calculations based on the examinations of the Institute of Brewing. May be repeated for credit

103. Physical and Chemical Methods for Food Analysis (5) I. Gruenwedel, G. Smith, Tappel

Lecture—3 hours; laboratory—6 hours. Prerequisite: Chemistry 5, 8B; Biological Sciences 103 (may be taken concurrently). An introduction to the theory and application of physical and chemical methods for determining the constituents of foods. Modern separation and instrumental analysis techniques are stressed.

104. Food Microbiology (3) II. Barrett, C. Price

Lecture—3 hours. Prerequisite: Biological Sciences 1A, 102. Microorganisms in food safety, spoilage, and production. Food-borne disease agents and their control. Growth parameters of food spoilage agents. Destruction of microbes in food. Food fermentations. The development of microbes as a resource for the food industry.

104L. Food Microbiology Laboratory (4) III. C. Price, Shuster

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: Biological Sciences 1A, course 104. Cultural and morphological characteristics of microorganisms involved in food spoilage, in food-borne disease, and food fermentation. Analysis of microbiological quality of foods.

107. Principles of Sensory Analysis of Foods (4) II. The Staff

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Agricultural Systems and Environment 120 or the equivalent course in statistics. Nature of sensory responses with emphasis on aroma, taste, and texture of foods; critical use of analytical laboratory methods; relation of sensory data to chemical and instrumental measurements; collection and statistical analysis and interpretation of sensory data.

108. Food Processing Plant Sanitation (3) II. Mer-son

Lecture—3 hours. Prerequisite: Chemistry 8B, Biological Sciences 1A. Discussion of factors relating to sanitary control of food processing including water treatment, chemical and physical sanitizing agents, principles of cleaning and hard surface detergency, metal corrosion, concepts in the disposal of wastes and the pertinence of government control agencies.

109. Principles of Quality Assurance in Food Processing (3) III. Reid

Lecture—2 hours; discussion—1 hour. Prerequisite: Statistics 13 or Agricultural Systems and Environment 120. Quality assurance measurement techniques applied to selected food processed products emphasized. Rationale for establishing valid quality assurance programs including selection of samples at critical points. Statistical problems in quality assurance programs used by the food industry.

110A. Physical Principles in Food Processing (3) I. K. McCarthy

Lecture—2 hours; laboratory—2 hours. Prerequisite: Physics 5A and 5B or the equivalent; calculus recommended. Not open for credit to students enrolled in College of Engineering. Applications of the conservation of mass and energy to food processing. Elements of engineering thermodynamics, fluid mechanics, and problem solving.

110B. Heat and Mass Transfer in Food Processing (3) II. Singh

Lecture—3 hours. Prerequisite: course 110A or the equivalent; Applied Biological Systems Technology 110L recommended (may be taken concurrently). Rate processes: conduction, convection, and radiation heat transfer; microwave heating, refrigeration, freezing, psychrometrics; mass transfer during drying, and storage.

117. The Senses, Sensory Measurement, Psychophysics, and Food (4) I. O'Mahony

Lecture—4 hours. Prerequisite: Biological Sciences 1A; Statistics 13 or Agricultural Systems and Environment 120 (may be taken concurrently). Structure and function of sensory receptor systems; psychological and physiological variables affecting sensory responses. Critical examination of modern psychophysical methods for the investigation of the mechanisms of human sensory systems. Problems of sensory measurement and their relation to food flavor.

119. Chemistry and Technology of Milk and Dairy Products (4) III. Hutchens

Lecture—4 hours; demonstrations and a field trip. Prerequisite: Biological Sciences 1A and 102, or consent of instructor. Composition, structure and properties of milk and products derived from milk. Relates chemical, microbiological, and technological principles to commercial practices in processing of milk and its products.

120. Principles of Meat Science (3) III. Bandman, Lee (Animal Science)

Lecture—3 hours. Prerequisite: Biological Sciences 103 or the equivalent. Anatomical, physiological, developmental and biochemical aspects of muscle underlying the conversion of muscle to meat. Includes meat processing, preservation, microbiology and public health issues associated with meat products. (Same course as Animal Science 120.)

120L. Meat Science Laboratory (2) III. Lee (Animal Science), Bandman

Discussion—1 hour; laboratory—3 hours. Prerequisite: Biological Sciences 103; course 120 (may be taken concurrently). Laboratory exercises and student participation in transformation of live animal to carcass and meat, structural and biochemical changes related to meat quality, chemical and sensory evaluation of meat, and field trips to packing plant and processing plant. (Same course as Animal Science 120L.)

121. Principles of Poultry Product Technology (3) I. King (Avian Sciences)

Lecture—3 hours. Prerequisite: Biological Sciences 103 (may be taken concurrently). Quality, preservation, and processing of avian products. Topics include quality control, nutrition, chemistry, biochemistry, microbiology, and functional properties.

***122. Marine Food Science** (3) II. Ogrzydzak, Haard

Lecture—3 hours. Prerequisite: Biological Sciences 1A, 103 (may be taken concurrently). Biochemical, microbiological, and ecological principles unique to fish; where fish are found and why; fishing and landing techniques as they influence quality; processing, storage, and public health aspects of marine organisms; resource development, including aquaculture. Offered in alternate years.

123. Introduction to Enzymology (3) III. Whitaker

Lecture—3 hours. Prerequisite: Biological Sciences 103. Principles of physical, chemical and catalytic properties of enzymes and their importance. Purification, characterization, and quantitative evaluation of reaction conditions on activity are stressed. Specificity and mechanism of action illustrated by use of selected enzymes. (Former course Biochemistry and Biophysics 123.)

123L. Enzymology Laboratory (2) III. Whitaker
Lecture—1 hour; laboratory—3 hours. Prerequisite: Biological Sciences 103, course 123 (concurrently). Laboratory procedures involved in detection, purification and characterization of enzymes. (Former course Biochemistry and Biophysics 123L.)

125. Corrosion Principles in Food Processing Interactions (3) II. Gruenwedel
Lecture—3 hours. Prerequisite: Mathematics 16B; Physics 5C; Chemistry 8B. Course presents thermodynamic and kinetic principles of container-product interactions (internal corrosion) and investigates how these interactions affect the wholesomeness of processed, canned foods.

128. Food Toxicology (3) III. Gruenwedel, Shibamoto (Environmental Toxicology)
Lecture—3 hours. Prerequisite: Biological Sciences 102, 103. Chemistry and biochemistry of toxins occurring in foods, including plant and animal toxins, intentional and unintentional food additives. The assessment of food safety and toxic hazards. (Same course as Environmental Toxicology 128.)

131. Food Packaging (3) III. Krochta
Lecture—3 hours. Prerequisite: Chemistry 8B, Biological Sciences 1A, Physics 5B. Principles of food packaging. Familiarized students with functions, materials, properties, fabrication, applications and regulation of food packaging.

***140. Food Laws and Regulation (3)** I. The Staff
Lecture—3 hours. Prerequisite: upper division standing. Legal and scientific issues involved in the regulation of the nation's food supply and nutritional status. Philosophy underpinning the application of regulatory statutes. Sources of information necessary for communication with government on public food policy information.

150. Thermal Processing of Foods (3) III. Merson
Lecture—2 hours; discussion, demonstration, and problem workshops—2 hours. Prerequisite: courses 104 and 110B or the equivalent. Theory and practical considerations of thermal processes by canning, pasteurization, and aseptic processing. Process calculations of microbial inactivation and chemical changes to safeguard public health, nutrition, and consumer acceptance. Description and engineering analysis of thermal processing equipment.

150L. Thermal Processing Laboratory (2) III. Merson
Laboratory—6 hours. Prerequisite: courses 104 and 110B; course 150 (may be taken concurrently). Laboratory exercises and student participation in the use and application of thermal processing methods and related procedures, and the interpretation of results, including evaluation of can closures, operation of thermal processing equipment, and the development and testing of sterilization processes.

151. Freezing Preservation of Food (3) II. Reid
Lecture—3 hours. Prerequisite: course 110B, Biological Sciences 1A, and Chemistry 8B; course 104 recommended. Freezing of model systems and food with emphasis on physicochemical aspects. Consequences of food freezing and thawing. Modeling of freezing for predictive purposes. Visualization and characterization of frozen materials. Offered in alternate years.

156. Computer Interfacing for Laboratory and Process Control (4) III. Russell
Lecture—3 hours; laboratory—3 hours. Prerequisite: consent of instructors. Principles of micro- and mini-computer use in measurement and control of laboratory instrumentation and processing operations with both theoretical and practical aspects of computer interfacing.

160. Food Product Development (2) II. The Staff (Henderson in charge)
Lecture—2 hours. Prerequisite: course 1 or 2 or 100A. Basic principles of food product research and development from concept to final product. Idea generation and associated screening and evaluation procedures for food formulation. Research and development project management.

160L. Food Product Development Laboratory (2) II. The Staff (Henderson in charge)
Discussion—1 hour; laboratory—3 hours. Prerequisite: course 160 concurrently. Laboratory exercises applying the principles of food product research and development to new food products.

180. Food Processing (4) III. M. McCarthy
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 100B, 104, 100C. Recent advances in food processing are examined in terms of their effects on the various physical properties of the raw material. Pilot plant exercises will be employed to identify and illustrate common principles among apparently diverse processes.

190. Senior Seminar (1) I. Reid, German Seminar—1 hour. Prerequisite: senior standing or consent of instructor. Selected topics presented by students on recent advances in food science and technology. Reports and discussions concerning oral and written presentations, literature sources and career opportunities.

192. Internship for Advanced Undergraduates (1-12) I, II, III. The Staff (Barrett in charge)
Internship—3-36 hours. Prerequisite: consent of instructor. Work experience on or off campus in the practical application of food science. (P/NP grading only.)

196. Methods of Fruit and Vegetable Analysis (2) III. The Staff
Lecture—10 hours total; laboratory—30 hours total. Prerequisites: Chemistry 2C, course 100B. Principles of and laboratory methods for the color, texture, and flavor analysis of California fruits and vegetables used in food processing. Held during the first two weeks immediately following the last day of spring quarter; considered a spring course for registration.

198. Directed Group Study (1-5) I, II, III. The Staff (Barrett in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Barrett in charge) (P/NP grading only.)

Graduate Courses

201. Food Chemistry and Biochemistry (3) I. Tapel, Bernhard, Gruenwedel
Lecture—3 hours. Prerequisite: Biological Sciences 103. Topics on enzymes, proteins, pigments, lipids, and vitamins. Biochemical principles and methods related to food composition, preservation, and processing. Research proposals and group problem solving.

202. Chemical and Physical Changes in Food (4) II. Reid, Haard
Lecture—3 hours; term paper. Prerequisite: Biological Sciences 103; Chemistry 107B. Fundamental principles of chemistry and physics are applied to a study of changes in water binding properties and activity, changes in proteins, nutrients, toxic constituents, and other compounds during storage, heating, freezing, dehydrating, and concentrating of food materials.

203. Food Processing (3) II. K. McCarthy
Lecture—3 hours. Prerequisite: Physics 6C, Mathematics 16C, Chemistry 107B, undergraduate food processing course. Principles of food engineering applied to food processing. Relationship of Newtonian and non-Newtonian fluid properties to heat and momentum transfer. Application of mass transfer in controlling kinetics and quality changes of foods.

204. Advanced Food Microbiology (3) III. Barrett in charge
Lecture—3 hours. Prerequisite: Biological Sciences 1C, 103, course 104 or a course in microbiology. Principles of and recent developments in food microbiology, including food pathogen virulence and detection, parameters of microbial growth in food, and the microbiology of food and beverage fermentation.

205. Industrial Microbiology (3) I. Ogrydziak
Lecture—3 hours. Prerequisite: Biological Sciences 1A and 102, 103; Microbiology 130A-130B or Genetics 102 recommended. Use of microorganisms for producing substances such as amino acids, peptides, enzymes, antibiotics and organic acids.

Emphasis on metabolic regulation of pathways leading to fermentation products, on yeast fermentations, and on genetic manipulations (including recombinant DNA techniques) of industrial microorganisms. Offered in alternate years.

207. Advanced Sensory-Instrumental Analyses (3) III. Noble (Viticulture and Enology)
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 107 and consent of instructor. Basic principles of measurement of color, texture, and flavor of foods by sensory and instrumental methods. Advanced statistical analysis of relation of colorimetry, texturometry, and chemistry of volatile compounds to perception of appearance, texture, flavor. Offered in alternate years.

210. Proteins: Functional Activities and Interactions (3) II. Whitaker
Lecture—3 hours. Prerequisite: Biological Sciences 103. The relationships of structure of proteins to their biological functions. Structural proteins, complexing proteins, and catalytic proteins in plant and animal materials and products.

211. Lipids: Chemistry and Nutrition (3) I. German
Lecture—3 hours. Prerequisite: Biological Sciences 103, Chemistry 107B, 128B. Chemistry of lipids as it pertains to research in food and nutrition. Relations between lipid structure and their physical properties in tissues and foods. Regulation of absorption, transport, and metabolism of lipids. Implications of dietary fats and health.

235. Mycology of Food and Food Products (3) II. Miller
Lecture—3 hours. Prerequisite: course 104 or consent of instructor. Morphology and physiology of fungi associated with food. Desirable activities of fungi: food fermentations, single-cell protein production, mushroom culture. Undesirable activities: preharvest and postharvest deterioration, food spoilage and preservation, toxin production.

250. Chromatographic and Electrophoretic Methods (4) II. G. Smith, Bandman, German
Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 1A-1B-1C, 8A-8B, 107A-107B; Biological Sciences 102 and 103 or consent of instructor. Theory and practice of gas and liquid chromatography and electrophoresis for analytical and preparative applications. Choice and optimization of separation methods, detection systems and recovery of purified sample components.

250L. Chromatographic and Electrophoretic Methods Laboratory (1) II. G. Smith, Bandman, German
Laboratory—3 hours. Prerequisite: course 250 concurrently. Practice of gas and liquid chromatography and electrophoresis for analytical and preparative applications. Choice and optimization of separation methods, detection systems, and recovery of purified sample components.

256. Computer Applications in Laboratory and Process Control (3) III. Russell
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 156 or the equivalent. Theory and practice of microcomputer interfacing to laboratory instrumentation for analytical and process control applications. Study of methods common to modern instrumentation and control systems including: A/D and D/A conversions, transducers, signal conditioning, and data transmission.

270. Critical Evaluation of Scientific Literature (1) I, II, III. Shuster, Price
Discussion—2 hours. Prerequisite: consent of instructor. Contemporary research topics in biological sciences. Students choose, present and lead discussion of recent research articles in a special topic area chosen by instructor. Intended to develop skills in critical evaluation of scientific publications. May be repeated for credit.

290. Seminar (1) I, II. C. Price
Seminar—1 hour. (S/U grading only.)

290C. Advanced Research Conference (1) I, II, III. The Staff (Barrett in charge)
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Critical presentation and

evaluation of original research by graduate students. Planning of research programs and proposals. Discussion led by individual major instructors for their research group. (S/U grading only.)

291. Advanced Food Science Seminar (1) III. C. Price

Seminar—1 hour. Prerequisite: completion of at least one quarter of course 290. Oral presentation of student's original research, discussion, and critical evaluation. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Barrett in charge)

299. Research (1-12) I, II, III. The Staff (Barrett in charge)

Prerequisite: graduate standing. (S/U grading only.)

Food Service Management

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Nutrition.

The Major Program and Graduate Study

Food Service Management is incorporated within the major in Dietetics. If you are interested in preparing for a career in commercial organizations such as hotels, restaurants, industrial cafeterias, or contract food services, as well as in public or private institutions such as hospitals, correctional institutions, schools, or colleges, consult the Department of Nutrition.

Related Courses. See Food Science and Technology, and Nutrition.

Courses in Food Service Management (FSM)

Questions pertaining to the following courses should be directed to the instructor or to the Nutrition Department Advising Office, 1151 Meyer Hall (916-752-2512).

Upper Division Courses

120. Principles of Quantity Food Production (3) III. Prophet

Lecture—3 hours. Prerequisite: Food Science and Technology 100B and 101BL. Fundamental principles of food service management including quantity food preparation, institutional equipment, receiving and storage, service, menu planning, merchandising, and safety.

120L. Quantity Food Production Laboratory (2) I, II. Prophet

Laboratory—6 hours. Prerequisite: course 120. Laboratory experience in quantity food production and service.

121. Institutional Food Purchasing and Sanitation (3) I. The Staff

Lecture—1 hour; discussion—2 hours. Prerequisite: Biological Sciences 1A; course 120. Principles of quantity food purchasing and sanitation.

122. Food Service Systems Management (3) II. Prophet

Lecture—3 hours. Prerequisite: Agricultural Economics 112, courses 120, 120L, 121. Principles of quantity food production management: production schedules, portion control, financial management, layout and equipment planning, evaluation of alternative systems, and computer applications.

123. Personnel Management (3) III. The Staff

Lecture—3 hours. Prerequisite: a basic course in general psychology. Major personnel management functions; legal constraints and requirements; procedures in solving personnel problems faced by supervisors.

192. Internship (1-12) I, II, III. The Staff

Internship—3-36 hours. Prerequisite: one upper divi-

sion course in Food Service Management and consent of instructor. Work experience on or off campus in practical aspects of food service management, supervised by a faculty member. (P/NP grading only.)

197T. Tutoring in Food Service Management (1-2) I, II, III. The Staff (Prophet in charge)

Discussion/laboratory—3 or 6 hours. Prerequisite: Dietetics or related major; completion of the Food Service Management course in which tutoring is done. Tutoring of students in food service management, assistance with discussion groups or laboratory sections; weekly conference with instructor in charge of course; written evaluations. May be repeated if tutoring a different course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Prophet in charge)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Prophet in charge)

(P/NP grading only.)

French

(College of Letters and Science)

Manfred Kusch, Ph.D., Chairperson of the Department

Department Office (French and Italian), 515 Sproul Hall (916-752-0830)

Faculty

Marc E. Blanchard, Agrégé de Lettres, Professor (*French, Critical Theory*)

Edward M. Bloomberg, Ph.D., Associate Professor

Michele Hannoosh, Ph.D., Associate Professor

(*French, Comparative Literature*)

Manfred Kusch, Ph.D., Senior Lecturer (*French, Comparative Literature*)

Maria I. Manea-Manoliu, Ph.D., Professor

Michèle Praeger, Ph.D., Associate Professor

Georges Van Den Abbeele, Ph.D., Associate Professor

Emeriti Faculty

Claude Abraham, Ph.D., Professor Emeritus

Max Bach, Ph.D., Professor Emeritus

Ruby Cohn, Ph.D., Professor Emerita

Gerald Herman, Ph.D., Senior Lecturer Emeritus

Margo R. Kaufman, M.A., Senior Lecturer Emerita

Marshall Lindsay, Ph.D., Professor Emeritus

Ruth B. York, Ph.D., Senior Lecturer Emerita

The Major Program

The major program is designed to assure proficiency in all four of the language skills—speaking, understanding, reading, and writing—and to acquaint students with the intellectual and cultural contributions of the French-speaking world through the study of its literature, traditions, and institutions.

The Program. The department is strongly committed to undergraduate education. It encourages its students to work closely with the academic adviser in designing a major tailored to their needs and interests within the broad requirements prescribed by the program and to avail themselves of the guidance of an excellent teaching faculty. The department sponsors an active French Club and a chapter of Pi Delta Phi, the National French Honor Society. Each year, a substantial number of students with a good preparation in French participate in the university's very popular Education Abroad Program, which maintains centers at seven French universities.

Career Alternatives. Foreign language teachers, a cardiologist, a veterinarian, a naval commander at the Pentagon, a professor of Political Science, lawyers, sales representatives, journalists, an anesthesiologist, a law professor, translators, a senior applications programmer, travel agents, independent business owners, a senior museum preparator, nurses, financial managers, stock brokers, and an industrial attaché for a French Trade Commission, all graduated with an

A.B. in French from UC Davis and represent only a small fraction of the career choices documented in a recent survey of department graduates.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	19-36
French 1, 2, 3 (or the equivalent)	0-15
French 20	2
French 21, 22, 23	15
Linguistics 1	4
Depth Subject Matter	44
French 100	4
French 101, 102, 103	12
French 104	4
Two additional upper division French literature courses	8
Elective courses in French literature, language, or civilization to be chosen in consultation with undergraduate adviser	16
Total Units for the Major	63-80

Recommended

French 101, 102, 103, 104, 107, and 160 plus other upper division courses for a total of 45 units for students interested in obtaining a "single subject" teaching credential in California.

Major Adviser. G. Herman.

Minor Program Requirements:

	UNITS
French	24
French 100	4
French 101, 102, 103	12
Two elective courses in French language, literature, or civilization to be chosen in consultation with undergraduate adviser	8

Prerequisite Credit. Credit will not normally be given for a course if it is the prerequisite of a course already successfully completed. Exceptions can be made by the Department Chairperson only.

Honors Program. Candidates for high or highest honors in French must write a senior thesis under the direction of a faculty member. For this purpose, honors candidates must enroll in at least six units of French 194H distributed over two quarters. Normally, a student will undertake the honors project during the first two quarters of the senior year; other arrangements must be authorized by the department chair. Only students who, at the end of the junior year (135 units), have attained a cumulative grade-point average of 3.5 in courses required for the major will be eligible for the honors program. The requirements for earning high and highest honors in French are in addition to the regular requirements for the major in French.

Graduate Study. The Department offers programs of study and research leading to the M.A. and Ph.D. degrees in French.

Candidates for the Ph.D. have the option of enriching their degree program by preparing a designated emphasis in either Critical Theory or Feminist Theory and Research, which are offered by the Program in Critical Theory and The Women's Studies Program, respectively. Detailed information may be obtained from the graduate advisers or the department chairperson.

Graduate Advisers. M.I. Manea-Manoliu (M.A., Ph.D. degrees—French Linguistics); M.E. Blanchard (M.A., Ph.D. degrees—French Literature).

Teaching Credential Subject Representative. J. Wagnild. See also under the Teacher Education Program.

Courses in French (FRE)

Students offering high school language preparation as a prerequisite must take a placement test.

Course Placement. Students with two years of high school French normally take French 2, those with three years take French 3 and those with four years take French 21.

Lower Division Courses

1. Elementary French (5) I, II, III. The Staff
Discussion—5 hours; laboratory—1 hour. Students who have successfully completed French 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.

1G. French for Graduate Students (5) III. The Staff (Chairperson in charge)
Lecture/discussion—5 hours. A course designed to prepare students for the graduate reading examination in French. (P/NP grading only.)

2. Elementary French (5) I, II, III. The Staff
Discussion—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of course 1.

3. Elementary French (5) I, II, III. The Staff
Discussion—5 hours; laboratory—1 hour. Prerequisite: course 2. Continuation of course 2.

8. French Conversation (2) I, II, III. The Staff
Recitation—3 hours. Prerequisite: course 3 or the equivalent. Practice in initiating and maintaining conversation. Oral presentations, oral quizzes, and oral final exam. May be repeated once for credit. Not open to native speakers.

20. Practical Phonetics (2) II, III. The Staff
Lecture/laboratory—3 hours. Prerequisite: course 3 or the equivalent. Practically oriented presentation of French sounds and intonational pattern. Laboratory drills with emphasis on phonetic features specific to contemporary spoken French. Students will use the international phonetic alphabet. Not open for credit to students who have completed course 5. (Former course 5.)

21. Intermediate French (5) I, II, III. The Staff
Lecture/discussion—5 hours. Prerequisite: course 3. Grammar, oral practice, composition. Initiation to French institutions; reading and discussion of short literary texts.

22. Intermediate French (5) I, II, III. The Staff
Lecture/discussion—5 hours. Prerequisite: course 21. Continuation of course 21. Grammar, oral practice, composition. Contemporary French culture; reading and discussion of a play.

23. Intermediate French (5) I, II, III. The Staff
Lecture/discussion—5 hours. Prerequisite: course 22. Continuation of course 22. Contemporary art, practice, composition. Current topics in French politics and culture; reading and discussion of a novel.

***25. Introduction to French Literature in Translation (3) II.** The Staff
Discussion—3 hours. Introductory study of outstanding works of French drama and prose. Topics include major authors, genres, literary periods/movements. Study of literary techniques, structure, and meaning to foster better understanding of creative processes in French cultural context. Intended for the nonmajor. General Education credit: Civilization and Culture.

***35. Explication and Dissertation (2) III.** The Staff (Chairperson in charge)
Lecture/discussion—2 hours. Prerequisite: course 22. Theory and practice of French *explication de texte* and *dissertation*. Especially recommended for those students planning to study abroad in French universities.

38. Intermediate French Conversation (2) I, II, III. The Staff
Recitation—3 hours. Prerequisite: course 8 or the equivalent. Continued practice in initiating and maintaining conversation. Oral presentations, oral quizzes, and oral final exam. May be repeated once for credit. Not open to native speakers.

98. Directed Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100. Compositions in French (4) I, II, III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 23; course 20 strongly recommended. Instruction and practice in expository writing in French, with emphasis on organization, correct syntax, and vocabulary building.

101. Introduction to French Poetry (4) I, II, III. The Staff
Lecture—3 hours; short papers. Prerequisite: course 100 or consent of instructor. Analysis and evaluation of works representing the main types of French poetry. Study of French poetic conventions and versification.

102. Introduction to French Drama (4) I, II, III. Abraham
Lecture—3 hours; short papers. Prerequisite: course 100 or consent of instructor. Analysis and evaluation of plays representing the main types of French drama, with emphasis on dramatic structure and techniques.

103. Introduction to French Prose (4) I, II, III. The Staff
Lecture—3 hours; short papers. Prerequisite: course 100 or consent of instructor. Analysis and evaluation of works representing main types of French prose, with emphasis on narrative structure and techniques.

104. Translation (4) I, II. The Staff
Lecture—3 hours; numerous short in-class translations; frequent supplementary outside reading. Prerequisite: course 100 or the equivalent. Practice in English-to-French translations using a variety of non-literary materials, illustrating different problems and styles. Not open to students who have spent an academic year as an EAP student in a Francophone country or who have completed course 138.

***106. French in Business and the Professions (4) I.** Herman
Lecture—1 hour; discussion—2 hours; frequent written assignments. Prerequisite: course 100 or consent of instructor. The French language as used in the commercial sphere. Emphasis on proper style and form in letter-writing, and in non-literary composition. Technical terminology in such diverse fields as government and world business.

107. Contemporary France (4) III. Praeger
Lecture—3 hours; term paper. Prerequisite: course 100 or consent of instructor. Introduction to aspects of French culture and institutions of the contemporary period such as art, architecture, music, literature. Provides a background in French contemporary history, sociology, and institutions.

***110. Stylistics and Creative Composition (4) II.** Herman
Lecture—3 hours; frequent papers. Prerequisite: course 100 or consent of instructor. Intensive course in creative composition using a variety of techniques and literary styles, patterned on Queneau's *Exercices de style*. Practice in such stylistic modifications as inversion, antithesis, changes in tense, mood, tonality, etc. The writing of poetry.

***112. Masterpieces of French Drama in Translation (3) II.** The Staff
Discussion—3 hours. Prerequisite: course 25 or consent of instructor. Plays in translation representing the main types of French drama with emphasis on dramatic structure and techniques. Consideration of this genre within French social and cultural context. Intended for the nonmajor. General Education credit: Civilization and Culture.

***113. Masterpieces of French Novel in Translation (3) III.** The Staff
Discussion—3 hours. Prerequisite: course 25 or consent of instructor. Novels in translation representing works from the seventeenth century to the present. Study of broad generic, theoretical, and historical contexts in France. Analysis of structure and techniques of the genre. Intended for the nonmajor. General Education credit: Civilization and Culture.

***114. French Philosophical Literature in Translation (3) III.** The Staff
Discussion—3 hours. Prerequisite: course 25 or consent of instructor. French philosophical literature, with works analyzed within broad philosophic, moral, and

historical contexts. Focus on such topics as stoicism, classicism, libertinism, naturalism, existentialism, absurdism. Literary techniques and styles analyzed. General Education credit: Civilization and Culture.

115. Medieval French Literature and Society (4) I. Van Den Abbeele
Lecture/discussion—3 hours; term paper. Prerequisite: course 101, 102, or 103. The social and cultural life of medieval France as studied through its representation in such literary works as *La Chanson de Roland*, courtly love lyric, the Arthurian romances of Chretien de Troyes, *Aucassin et Nicolette*, selected fabliaux and farces. Offered in alternate years.

***116. The French Renaissance (4) III.** Van Den Abbeele
Lecture/discussion—3 hours; term paper. Prerequisite: course 101, 102, or 103. Overview of major works and writers with particular attention to the historical context of the turbulent 16th century. Writers to be read may include Rabelais, Marot, Ronsard, Du Bellay, Labe, Marguerite de Navarre, Montaigne, and D'Aubigne. May be repeated once for credit when topic differs. Offered in alternate years.

***117A. Baroque and Preclassicism (4) II.** Abraham
Lecture/discussion—3 hours; term paper. Prerequisite: course 101, 102, or 103. The literature and intellectual culture of the period between the Renaissance and French classicism. Offered in alternate years.

117B. The Classical Moment (4) III. Abraham
Lecture/discussion—3 hours; term paper. Prerequisite: course 101, 102, or 103. Literature, culture, and politics in the "Age of Louis XIV." May be repeated once for credit when topic differs. Offered in alternate years.

118A. The Age of Reason and Revolution (4) II. Kusch
Lecture/discussion—3 hours; term paper. Prerequisite: course 101, 102, or 103. Literature and philosophy of the French Enlightenment. Readings from such authors as Bayle, Fontenelle, Montesquieu, Voltaire, Rousseau and Diderot. Offered in alternate years.

***118B. Private Lives and Public Secrets: The Early French Novel (4) II.** Kusch
Lecture/discussion—3 hours; term paper. Prerequisite: course 103. History of the French *roman* from the Middle Ages to the Revolution with particular emphasis on the novels of the 18th century. Offered in alternate years.

***119A. The Romantic Imaginary (4) II.** Hannoosh
Lecture/discussion—3 hours; term paper. Prerequisite: course 101, 102, or 103. Major concepts and themes of French Romanticism, such as dream and the supernatural, impossible love, exoticism, revolution, individualism, nature, the *mal du siècle*, Romantic irony, the creative imagination, the cult of ruin. Offered in alternate years.

119B. Realism, History and the Novel (4) III. Hannoosh
Lecture/discussion—3 hours; term paper. Prerequisite: course 101, 102, or 103. Investigation of the narrative and historical codes of French realist fiction, with emphasis on the representation of history in the realist novel, its depiction of social "realities" such as class and gender, and its relation to the historical situation of post-revolutionary society. Offered in alternate years.

119C. From Baudelaire to Surrealism (4) I. Hannoosh
Lecture/discussion—3 hours; term paper. Prerequisite: course 101. Study of the main poets and poetic movements from the mid-19th to the early 20th century, including Baudelaire, the Symbolists, and the Surrealists. Offered in alternate years.

***120. Modern French Thought (4) I.** Praeger
Lecture/discussion—3 hours; term paper. Prerequisite: course 101, 102, or 103. Overview of post-Second World War French intellectual currents from existentialism to structuralism and deconstructionism. Readings will include Sartre and de Beauvoir, Camus, Levi-Strauss, Lacan, Barthes, Foucault, Derrida, Kristeva, Sollers, Cixous, and Irigaray. Offered in alternate years.

***121. Twentieth Century French Novel (4) II.**

Praeger

Lecture/discussion—3 hours; term paper. Prerequisite: course 103. Novels and theories of the novel, from Proust to the Nouveau Roman and beyond. Readings from among Gide, Sartre, de Beauvoir, Camus, Breton, Beckett, Robbe-Grillet, Sarraute, Simon, Barthes, Duras, Tournier, Perec, Modiano, Guibert, Toussaint. Offered in alternate years.

***124. Post-Colonialist and Francophone Literature (4) III.**

Praeger

Lecture/discussion—3 hours; term paper. Prerequisite: course 101, 102, or 103. Introduction to Post-Independence Black African and/or Caribbean and/or North African literatures written in French. Selected topics include: identity and subjectivity, the role of the intellectual, women's voices, languages and oral literatures, cultural syncretism, theories of postcolonialism. May be repeated once for credit when topic differs. Offered in alternate years.

***125. French Literature and Other Arts (4) II.**

Hannoosh

Lecture/discussion—3 hours; term paper. Prerequisite: course 101, 102, or 103. The relationship between French literature and other arts—painting, music, cinema, architecture, opera—from different periods. May be repeated once for credit when topic differs. Offered in alternate year.

***127. Paris: Modernity and Metropolitan Culture (4) III.**

Hannoosh

Lecture/discussion—3 hours; term paper. Prerequisite: course 101, 102, or 103. Study of the representation of Paris in 19th and 20th century texts and its importance in defining the experience and art of modernity. Offered in alternate years.

***130. From Page to Stage: Theatre and Theatricality (4) I.**

Abraham

Lecture/discussion—3 hours; term paper. Prerequisite: course 102. French theater as literature and performance. May be repeated once for credit when topic differs. Offered in alternate years.

133. Gender and Politics in French Literature and Culture (4) I.

The Staff

Lecture/discussion—3 hours; term paper. Prerequisite: course 101, 102, or 103. Examination of the thematic, theoretical and political tendencies in contemporary French fiction. Barthes, Foucault, Duras, Guibert, considered in terms of their writing on identity and gender. Offered in alternate years.

138. Advanced Literary Translation (4) II.

Bloomberg

Lecture—3 hours; numerous short in-class translations; frequent supplementary outside assignments. Prerequisite: course 100 or the equivalent, course 104 or the equivalent (such as one academic year as an EAP student in a Francophone country). English-to-French translation of a variety of modern literary texts.

140. Study of a Major Writer (4) II.

The Staff
Lecture—3 hours; term paper. Prerequisite: course 100 and course 101, 102, or 103 as appropriate to selected topic, or consent of instructor. Concentrated study of works of a single author. May be repeated once for credit as author-subject changes.

141. Selected Topics in French Literature (4) II.

The Staff

Lecture—3 hours; term paper or short papers. Prerequisite: courses 100 and 101 or 102 or 103 as appropriate to the selected topic or consent of instructor. Subjects and themes such as satiric and didactic poetry of the Middle Ages, poetry of the *Pléiade*, theater in the eighteenth century, pre-romantic poetry, etc. May be repeated twice for credit in a different subject area.

160. Topics in French Morphosemantics (4) III.

Manea-Manoliu

Lecture/discussion—3 hours; term paper. Prerequisite: course 100 and Linguistics 1. Analysis of controversial grammatical phenomena with emphasis on the semantic content and the pragmatic function of such categories as tense, mood and gender. Offered in alternate years.

***161. Modern French Syntax (4) III.**Manea-Manoliu
Lecture—3 hours; short papers. Prerequisite: course 160. Presentation of basic concepts of contemporary approaches to French syntax. Consideration of new explanations of so-called "irregular" phenomena in current language models.***162. History of French Language (4) II.**Manea-Manoliu
Lecture—3 hours; term paper. Prerequisite: course 160. Main periods in development of the French language, from Latin to contemporary popular aspects, with emphasis on relationship between socio-cultural patterns and evolution of the language.**192. Internship (1-12) I, II, III.**The Staff
Internship—3-36 hours; term paper. Prerequisite: upper division standing and consent of instructor. Practical application of the French language through work experience in government and/or business, culminating in an analytical term paper on a topic approved by the sponsoring instructor. (P/NP grading only.)**194H. Special Study for Honors Students (1-5) I,**

II, III. The Staff (Chairperson in charge)
Independent study—1-5 hours. Prerequisite: open only to French majors of senior standing who qualify for honors program. Guided research, under the direction of a faculty member, leading to a senior honors thesis on a topic in French literature, civilization, or language studies. (P/NP grading only.)

197T. Tutoring in French (1-4) I, II, III.The Staff
Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing and consent of Chairperson. Tutoring in undergraduate courses including leadership in small voluntary discussion groups affiliated with departmental courses. May be repeated for credit for a total of 6 units. (P/NP grading only.)**197TC. Tutoring in the Community (2-4) I, II, III.**Kaufman
Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing and consent of Chairperson. Tutoring in public schools under the guidance of a regular teacher and supervision by a departmental faculty member. May be repeated for credit for a total of 6 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200. Literary Analysis (4) I. The Staff
Seminar—3 hours; term paper. Prerequisite: graduate standing. Basic principles of applied literary theory. Concepts and methods of the critical analysis of literature and literary texts. Basic principles of bibliographic research will be covered at the beginning of the course.

***201. History of French: Phonology and Morphosyntax (4) III.** Manea-Manoliu
Seminar—3 hours; term paper. Prerequisite: courses 159, 160, 250A, or consent of instructor. Presentation of the main changes in the phonetic and grammatical structures of French, from Latin to contemporary spoken aspects.

***205A. Sixteenth-Century Literature: The Humanists (4) I.** The Staff
Seminar—3 hours. French humanism in its most varied forms. Although at different times Rabelais and Montaigne will be primarily studied, other leading intellectuals and religious writers will also receive attention. May be repeated for credit when different topic is studied.

***206A. Seventeenth-Century Literature: Theater (4) II.** Abraham
Seminar—3 hours. Works of Corneille, Racine, Molière, and minor dramatists. One or more authors may be covered. May be repeated for credit with consent of instructor when different topics are studied.

***206B. Seventeenth-Century Literature: Prose (4)**

I. The Staff

Seminar—3 hours; term paper and/or exposé. Works of authors such as Pascal, Descartes, Mme de Lafayette. One or more authors may be covered. May be repeated for credit with consent of instructor as different topics are studied from quarter to quarter.

206C. Seventeenth-Century Literature: Poetry (4)

III. Abraham

Seminar—3 hours; term paper and/or exposé. Studies of the works of one or more poets of the period. May be repeated for credit with consent of instructor.

***207A. Eighteenth-Century Literature: Philosophes (4) II.**

Kusch

Seminar—3 hours; term paper and/or exposé. Not a course in philosophy, but an examination of the role of philosophy in the design and context of literary works. Study of one or more authors. May be repeated for credit.

***207B. Eighteenth-Century Literature: Novel (4) III.**

The Staff

Seminar—3 hours. Rise of the novel. Study of narrative experiments in the context of the philosophical climate and new literary values. Course may treat one or more novelists of the period. May be repeated for credit when different topics are studied.

***208A. Nineteenth-Century Literature: Fiction (4) I.**

Hannoosh

Seminar—3 hours. Study of the works of one or several novelists and/or short-story writers of the period. May be repeated for credit with consent of instructor when different topics are studied.

***208B. Nineteenth-Century Literature: Poetry (4)**

III. Blanchard

Seminar—3 hours. Study of the works of one or several poets of the period. May be repeated for credit with consent of instructor when different topics are studied.

***209A. Twentieth-Century: Prose (4) II.** The Staff
Seminar—3 hours; term paper and/or exposé. Study of the works of one or several writers of the period.

***209B. Twentieth-Century: Theater (4) II.** The Staff
Seminar—3 hours; term paper and/or exposé. Study of the works of one or several dramatists of the period. May be repeated for credit with consent of instructor.

***209C. Twentieth-Century: Poetry (4) III.** The Staff
Seminar—3 hours; term paper and/or exposé. Study of the works of one or several poets of the period. May be repeated for credit with consent of instructor.

210. Studies in Narrative Fiction (4) I. Praeger
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

211. Studies in Criticism (4) II. Blanchard
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

212. Studies in the Theater (4) I. The Staff
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

213. Studies in Poetry (4) II. The Staff
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

214. Study of a Literary Movement (4) III. The Staff
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

***238. Advanced Literary Translation (4) III.**

Bloomberg

Seminar—3 hours; significant amounts of translation of texts. Designed to acquaint students with the basic principles of applied translation theory. Translation of texts chosen for their theoretical interest. Open to native French speakers only with consent of instructor.

250A. French Linguistics: Morphematics (4) I.

Manea-Manoliu

Seminar—4 hours. Prerequisite: courses 159, 160, or consent of instructor. Theoretical approach to French grammar, with emphasis on morphematics, i.e., a semantic analysis of grammatical categories, as well as of their paradigmatic and syntactic relations.

***250B. French Linguistics: Transformational Syntax (4) I.**

Manea-Manoliu

Seminar—4 hours. Prerequisite: course 250A or con-

sent of instructor. Presentation of French syntax exemplified by a core of transformational rules (such as subjectivization, passivization, relativization) focusing on the most recent developments in the field (i.e., case grammars, generative semantics, trace theory).

***251. Trends in French Contemporary Linguistics** (4) I. Manea-Manoliu

Seminar—3 hours; term paper. Prerequisite: course 250A or 250B or consent of instructor. Issues in contemporary French linguistic thought and their relationship to the development of theoretical linguistics. Topics such as pragmatics, semantics, symbolic logic, speech acts, etc. Intended for students in French linguistics or those interested in applying linguistic models to literature.

***261. Current Issues in Modern French Syntax** (4) II. Manea-Manoliu

Seminar—3 hours; term paper. Presentation of contemporary approaches to French syntax. Explanations of various less regular phenomena, with reference to on-going changes in modern spoken French.

297. Individual Study (1-5) I, II, III. The Staff (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Seminar—1-5 hours. May be repeated for credit with consent of instructor.

299. Research (1-12) I, II, III. The Staff (S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (S/U grading only.)

Professional Courses

***300. Teaching of a Modern Foreign Language** (3) III. The Staff

Lecture/discussion—3 hours. Prerequisite: senior or graduate standing; a major or minor in a modern foreign language.

390A. The Teaching of French in College (2) I. Wagnild

Lecture/discussion—2 hours. Prerequisite: graduate standing or consent of instructor. Course designed for graduate teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the university. (S/U grading only.)

390B. The Teaching of French in College (2) II. Wagnild

Lecture/discussion—2 hours. Prerequisite: graduate standing or consent of instructor. Course designed for graduate teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the university. (S/U grading only.)

390C. The Teaching of French in College (2) III. Wagnild

Lecture/discussion—2 hours. Prerequisite: graduate standing or consent of instructor. Course designed for graduate teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the university. (S/U grading only.)

Freshman Seminar Program

Francisco J. Samaniego, Ph.D., Program Director
Program Office, 17 Wellman (Teaching Resources Center) (916-752-6050)

Committee in Charge

Stephanie Beardsley, Ph.D. (Residence Life)
George H. Cardinet, III, D.V.M., Ph.D. (School of Veterinary Medicine)
Richard Castanias, Ph.D. (Graduate School of Management)

William G. Davis, Ph.D. (Academic Senate Committee on Courses)

Marina Estabrook, M.A. (Teaching Resources Center)

Todd Feinberg (Student Representative, ASUCD—Academic Affairs)

Louis Grivetti, Ph.D. (Previous FRS instructor)

Annie King, Ph.D. (College of Agricultural and Environmental Sciences)

Alan Jackman, Ph.D. (College of Engineering)

Rex Perschbacher, J.D. (School of Law)

Carolyn Wall, Ph.D. (College of Letters and Science)

Donal A. Walsh, Ph.D. (School of Medicine)

Course in Freshman Seminar (FRS)

(Questions pertaining to the following course should be directed to the instructor or to the Teaching Resources Center.)

Lower Division Course

1. Freshman Seminar (2) I, II, III., The Staff
Seminar—20 hours total (8 weeks). Prerequisite: open only to students who have completed fewer than 45 quarter units. Investigation of a special topic through shared readings, discussions, written assignments, and special activities (such as fieldwork, site visits, laboratory work, etc.). Emphasis upon student participation in learning.

Genetics

See Division of Biological Sciences; and Genetics (A Graduate Group), below

Genetics (A Graduate Group)

Kenneth Burtis, Ph.D., Chairperson of the Group
Group Office, 190 Briggs Hall (916-752-9092)

Faculty. Includes members drawn from the Colleges of Agricultural and Environmental Sciences, and Letters and Science, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Genetics offers programs of study and research leading to the M.S. and Ph.D. degrees. The Group is subdivided into three affinity groups: molecular, animal, and plant. Each of these affinity groups provides broad training in genetics, combined with an emphasis specific to its area. Both model genetic organisms and agricultural species are studied using molecular and classical approaches. For additional information regarding the program, contact the group administrative assistant at 916-752-9091.

Graduate Adviser. Consult Genetics Graduate Group Office.

Courses in Genetics (GGG)

Graduate Courses

201A. Transmission Genetics (3) I. Gepts
Lecture—3 hours. Prerequisite: Genetics 100, introductory statistics and calculus. Study of segregation, linkage, and mapping and the modifications of Mendel's original genetic model.

201B. Cytogenetics (3) II. Dvorak and Murray
Lecture—3 hours. Prerequisite: course 201A or consent of instructor. Study of cytogenetics including meiosis, recombination, chromosomes, haploidy,

aneuploidy, trisomics, monosomics, autopolyploids and intra- and interspecific manipulation.

201C. Molecular Genetics (3) III. Gasser, Williamson

Lecture—3 hours. Prerequisite: course 201A or consent of instructor. Current topics in molecular genetics at a graduate level, with emphasis on the relationship between classical genetic studies and current molecular research, as well as on the molecular techniques used to develop the basic concepts of molecular genetics.

201D. Quantitative and Population Genetics (3) III. St. Clair

Lecture—3 hours. Prerequisite: course 201A or consent of instructor. The basic concepts of quantitative and population genetics, including gene and genotypic frequencies, multiple factor hypothesis, phenotypic and genotypic values, heritability, selection, genetic variation and evolution in populations, and experimental methodologies.

202. Scientific Professionalism and Integrity (1) I. Yoder

Lecture—1 hour. Basic skills required of contemporary scientists will be reviewed. Topics include scientific conduct, manuscript preparation, grant writing, seminary presentations, and time management. Responsibilities of scientists to communicate results factually and thoughtfully will be emphasized. (S/U grading only.)

205. Molecular Genetics Laboratory (5) I, II, III. Privalsky and staff

Laboratory—15 hours. Prerequisite: Genetics 100 (may be taken concurrently) or the equivalent, enrolled in Genetics Graduate Group, consent of instructor. Students will conduct experiments in molecular genetics laboratories. Individual research problems will emphasize experimental design, experience with methodologies, and data interpretation. May be repeated up to three times for credit. (S/U grading only.)

207L. Research Methods in Plant Genetics Laboratory (2-5) I, II, III. Yoder and staff

Laboratory—6-15 hours. Prerequisite: course 207 (may be taken concurrently). Working knowledge of contemporary methodologies in plant genetics is obtained by participating in research programs of the various Plant Genetics Affinity Group members. (S/U grading only.)

291. Seminar in History of Genetics (2) II. Griese-mer (Philosophy)

Seminar—2 hours. Prerequisite: Genetics 100. The development of modern genetic theories beginning with Mendel.

292A. Seminar in Cytogenetics (1-3) I. The Staff
Seminar—1-3 hours. Prerequisite: course 201A or consent of instructor. Topics related to the deletion, duplication and rearrangement of chromosome regions. Offered in alternate years. (S/U grading only.)

292B. Seminar in Quantitative Genetics (1-3) II. The Staff

Seminar—1-3 hours. Prerequisite: course 201A or consent of instructor. Topics of current interest related to the inheritance of continuous characters. Offered in alternate years.

292C. Seminar in Developmental Genetics (1-3) I. The Staff

Seminar—1-3 hours. Prerequisite: course 201A or consent of instructor. Topics in the area of cell-specific control of genes in development. Offered in alternate years. (S/U grading only.)

292D. Seminar in Population, Evolutionary and Ecological Genetics (1-3) II. The Staff

Seminar—1-3 hours. Prerequisite: course 201A or consent of instructor. Topics related to the analysis and prediction of genetic changes in populations. Offered in alternate years. (S/U grading only.)

293. Seminar in Animal Genetics (1-3) III. The Staff
Seminar—1-3 hours. Prerequisite: course 201A or consent of instructor. Emphasis on recent advances in the field of animal genetics, ranging from quantitative genetics to molecular biology as it relates to animals. (S/U grading only.)

- 295. Seminar in Molecular Genetics (1-3) I.** The Staff Seminar—1-3 hours. Prerequisite: course 201A or consent of instructor. Topics of current interest related to the structure, modification and expression of genes. (S/U grading only.)
- 297. Seminar in Plant Genetics (1-3) II.** The Staff Seminar—1-3 hours. Prerequisite: course 201A or consent of instructor. Current topics in plant genetics will be examined in student-conducted seminars and discussion format. The integration of molecular, organismal and population genetics to address questions in plant biology will be examined. (S/U grading only.)
- 298. Group Study (1-5) I, II, III.** Members of the Group (Chairperson in charge) Prerequisite: consent of instructor. Group Study of selected topics in Genetics. (S/U grading only.)
- 299. Research (1-12) I, II, III.** Members of the Group (Chairperson in charge) (S/U grading only.)

Geography

(College of Letters and Science)

Richard Cowen, Ph.D., Acting Chairperson of the Department
 Department Office, 2201 Hart Hall (916-752-0790, or 752-0792)

Faculty

- Nigel J. R. Allan, Ph.D., Associate Professor
 Conrad J. Bahre, Ph.D., Professor
 Dennis J. Dingemans, Ph.D., Associate Professor, *Academic Senate Distinguished Teaching Award*
 Deborah L. Elliott-Fisk, Ph.D., Associate Professor
 Louis E. Grivetti, Ph.D., Professor (*Geography, Nutrition*)
 Jack D. Ives, Ph.D., Professor
 Stephen C. Jett, Ph.D., Professor
 Janet D. Momsen, Ph.D., Professor
 Marilyn L. Shelton, Ph.D., Professor

Emeriti Faculty

- Howard F. Gregor, Ph.D., Professor Emeritus
 Frederick J. Simoons, Ph.D., Professor Emeritus
 Kenneth Thompson, Ph.D., Professor Emeritus

The Major Program

Geography is a multifaceted discipline defined by its concern with place. Geographers strive to answer spatial questions regarding the earth's surface and adjacent atmosphere and to describe and explain the character of regions; to ascertain the ways in which humans, historical and contemporary, have used and shaped the earth's surface; and to understand the physical, biotic, and human systems of our global environment and their interactions.

The Program. Both Bachelor of Arts and Bachelor of Science degrees are offered in geography. A.B. students choose one of five possible emphases: 1) general geography, encompassing the whole spectrum of the field; 2) cultural/historical geography, which stresses traditional human uses of the earth and the search for explanations of the different customs, beliefs, and lifeways characteristic of different parts of the world; 3) economic urban geography, which focuses on the locational factors affecting contemporary agricultural, industrial, and commercial activities, as well as on the characteristics and problems of urban centers; 4) physical geography, whose concern is the natural world, including climate, vegetation types, and the many physical features of the land's surface; and 5) regional planning and analysis, which emphasizes how geographic principles are applicable to contemporary urban and environmental concerns. These areas of emphasis will be closely integrated into the department's new specialization

in mountain geography. The B.S. program emphasizes physical geography courses with training in other physical and biological sciences and mathematics. A geography minor is also available.

Career Alternatives. The study of geography provides background for students interested in careers in education, business, industry, and government. In business and industry, opportunities for employment include positions in locational analysis, international trade, environmental consulting, transportation planning, remote sensing, environmental-impact analysis, market planning, and aerial photo interpretation. Local and state governments offer opportunities for employment in city, state, and regional planning and environmental analysis, while various federal departments need regional analysts, cartographers, remote-sensing experts, climatologists, and conservationists.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	10
Geography 1, 2, and 5	10
Depth Subject Matter	35-44
Geography 105 or 106; 151; and one UCD regional course from Geography 121-127	11-12
Choose one emphasis from the following five:	
<i>Emphasis I (General)</i>	24-28
One course from each of the following three groups:	
a. Geography 170 or 171;	
b. Geography 141 or 155;	
c. Geography 108 or 115;	
Four additional upper division geography courses.	
<i>Emphasis II (Cultural/Historical)</i>	28
Geography 170; 171; one course from 108, 115, 141, 155.	
Four additional courses from Geography 110, 143, 172, 173, 175.	
<i>Emphasis III (Economic/Urban)</i>	28
Geography 110; 141; 155; one course from 108, 115, 170, 171.	
Three additional courses from Geography 104, 142, 143, 156, 160, 161, 162.	
<i>Emphasis IV (Physical)</i>	31-32
Geography 3; 108; 110; 115; 162; 173; one course from 141, 155, 170, 171.	
One additional course from Geography 102, 112, 116, 117, 161.	
<i>Emphasis V (Regional Planning and Analysis)</i>	26-32
Geography 155 or 156; 110; one additional course from 121-127; and one course from 142, 160, 161, 162, 170, 173.	
Environmental Biology and Management 110; Environmental Biology and Management 134 or Environmental Studies 171; Political Science 107 or Environmental Studies 161; one course from Economics 115A, Agricultural Economics 148, or Geology 134.	
Total Units for the Major	45-54

Recommended: Geography 4.

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	57-64
Geography 1, 2, 3, and 5	16
Statistics 13 or the equivalent	4
Mathematics 16A, 16B, and 16C; or Mathematics 21A, 21B, and 21C	9-12
Computer Science Engineering 10 or 30	3-4
Chemistry 2A, 2B, 2C	15
Biological Sciences 1A	5
Biological Sciences 1B; or Biological Sciences 1C; or Geology 60-60L; or Physics 6A and 6B	5-8
Depth Subject Matter	43-45
Geography 105, 106, 108, 115, 151	20

Two courses from Geography 102, 110, 112, 116, 117, 162, 173	7-8
One course from Geography 121-127	3-4
Four additional upper division, letter-graded units in Geography	4
Nine additional upper division units chosen in consultation with the undergraduate adviser	9
Total Units for the Major	100-109

Recommended

Geography 4; Physics 8A, 8B and 8C; Chemistry 8A and 8B.

Addendum

The B.S. major provides a wide diversity of possible themes, including geomorphology, climatology, zoogeography, plant geography, nutritional geography, water-resource studies, and mathematical geography. An individual's program may emphasize one or more of these themes, and is planned in consultation with the major adviser.

Minor Program Requirements:

Letters and Science students who do not major in Geography may satisfy the requirements for a minor in the field by successfully completing the minimum units as follows. When choices of individual courses are required, these must be made in consultation with the major adviser.

	UNITS
Geography	19-20
<i>Minor I (General)</i>	
Geography 151, plus one course from each of the following four groups:	
Geography 108, 115, or 173	
Geography 170 or 171	
Geography 155, 160, or 161	
Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126, or 127	
<i>Minor II (Physical)</i>	
Geography 102, 108, 115, and 173, plus one course from 121, 122A, 122B, 123, 124, 125A, 125B, 126, or 127.	
<i>Minor III (Cultural)</i>	
Geography 170, 171, and 173, plus one course from each of the following two groups: Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126, or 127, and Geography 143, 172, or 175	
<i>Minor IV (Economic)</i>	
Geography 110 and 141, plus one course from each of the following three groups: Geography 142, 143, or 156; Geography 160, 161, 162, or 170; Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126, or 127.	
<i>Minor V (Environmental/Resource)</i>	
Geography 160, 161, 162, 173, and 175.	
<i>Minor VI (World Regional)</i>	
Geography 121, 122A or 122B, 123 or 124, 125A or 125B, 126 or 127.	

Major Adviser. See *Class Schedule and Room Directory*.

Graduate Study. The department offers programs of study leading to the M.A. and Ph.D. degrees. Information concerning these programs may be obtained from the Graduate Adviser, Department of Geography.

Graduate Adviser. See *Class Schedule and Room Directory*.

Courses in Geography (GEO)

Lower Division Courses

1. Physical Geography (4) III. Ives
 Lecture—3 hours; laboratory—2 hours. Basic physical elements of the human habitat, especially climate, landforms, soils, and natural vegetation.

*Course not offered this academic year.

2. Introduction to Cultural Geography (3) III. Jett
Lecture—3 hours. Traditional systems of habitat use: their characteristics, origin, occurrence, ecology. Development of contemporary cultural patterns and patterns in man-land relationships. Emphasis on the nonindustrial world. General Education credit with concurrent enrollment in course 2G: Contemporary Societies.

2G. Introduction to Cultural Geography: Discussion (1) III. Jett
Discussion—1 hour; short papers. Prerequisite: course 2 concurrently. Small group discussion of topics and readings assigned for course 2. Preparation and discussion of short papers. General Education credit with concurrent enrollment in course 2: Contemporary Societies.

***3. Climate and Weather** (4) I. Shelton; III. The Staff
Lecture—3 hours; discussion—1 hour. Basic concepts of climate and weather; energy and moisture exchanges, atmospheric pressure, global circulation and winds; instruments for obtaining climatological data; weather maps; severe storms; global, regional, and local climate and weather; climatic change; climate of California.

***4. Maps and Map Interpretation** (3) I. Bahre
Lecture—3 hours. Properties and components of maps. Major classes of projections. Types of maps, emphasizing relief, cadastral, thematic, and modern trends in mapping. History and development of cartography.

5. Introduction to Urban and Economic Geography (3) I. Momsen
Lecture—3 hours. The location of economic and urban activities. Patterns and theories of spatial organization: resource development, agricultural and manufacturing regions, urban systems, and urban structure. General Education credit with concurrent enrollment in course 5G: Contemporary Societies.

5G. Economic and Urban Geography: Discussion (1) I. Momsen
Discussion—1 hour; short papers. Prerequisite: course 5 concurrently. Small group discussion of topics and readings assigned for course 5. Preparation and discussion of short papers. General Education credit with concurrent enrollment in course 5: Contemporary Societies.

***6. Human Impacts on the Landscape** (4) I. The Staff
Lecture—4 hours. Local and global effects, through time, of human occupancy, economies, and technologies on wild and domesticated flora and fauna; soils; water; landforms; climate. Emphasis on landscape modification. Not intended for students planning to take course 161 or 170.

10. The World's Regions (3) II. Dingemans; III. Allan
Lecture—3 hours. The major geographic regions of the world; their origins, physical environments, cultures and economies; their interactions and global roles. Designed for non-majors.

***50. Geography and Environmental and Regional Planning** (3) III. Dingemans
Lecture—3 hours. Principles of spatial planning for regional change. Policies for environmental, economic, and social modifications. Illustrated case studies include: U.S. city planning, USSR industrial and population shifts, European regional plans, Chinese agricultural and environmental programs.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.)

99. Independent Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor, primarily for lower division students. (P/NP grading only.)

Upper Division Courses

102. Field Course in Physical Geography (4) III. The Staff
Lecture and field trip—normally one day per week. Prerequisite: courses 1 and 2 and consent of instructor. Research methodology and field study. System-

atic mapping and analysis of elements of the natural landscape.

***104. Field Course in Urban Geography** (4) III. Allan
Lecture—1 hour; full-day field trip. Field analysis of selected urban problems in California. Special attention to regional interrelationships, functional structure, and land-use changes as specifically related to the core of the city, changing residential and retail patterns, and urban encroachment on agricultural lands.

105. Cartography (4) II. The Staff
Lecture—1 hour; laboratory—8 hours. Prerequisite: course 4 or consent of instructor. Compilation and generalization of base-map data; symbolization and processing of map data; cartographic design and lettering techniques; map reproduction.

106. Aerial Photo Interpretation and Remote Sensing (4) II. Bahre
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 1 or consent of instructor. Basic photogrammetry, sensors and platforms, aerial-photo interpretation, and remote-sensing applications.

107. Advanced Cartography (4) III. The Staff
Lecture—1 hour; laboratory—8 hours. Prerequisite: course 105. Advanced principles and techniques of cartographic representation. Emphasis on scribing, plate-making, process photography, color separation, and color proofing. Use of contemporary cartographic and photographic equipment utilized in producing maps.

108. Analysis of Landforms (4) I. Ives
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Introduction to landforms and geomorphic processes. Topics include structural landforms, rock weathering and soil genesis, hillslope processes, and fluvial, glacial, and coastal landscapes.

***110. Quantitative Spatial Analysis** (4) I. Dingemans
Lecture—3 hours; term paper. Prerequisite: course 1, 2, or 5, and Statistics 13 or 102 recommended. Methods for geographic research and location planning; quantitative summary and analysis of spatial data patterns and trends; optimal-location solutions; includes correlation, regression, and use of pre-packaged computer programs.

***112. Coastal Landforms and Landscapes** (4) III. Elliott-Fisk
Lecture—3 hours; discussion—1 hour. Prerequisite: course 108 or consent of instructor. Examination of the landforms and geomorphic processes found along coasts. Analyses of coasts in a variety of lithologic, tectonic, and "wave-climate" settings. Emphasis on the Quaternary history of coastal landscapes. Offered in alternate years.

***115. Mesoclimatology** (4) III. Shelton
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Areal energy and moisture exchanges at the earth/atmosphere interface: physical controls, spatial and temporal variations, measuring and modeling the exchange processes, classification of mesoclimates. Climatic and related processes in areal systems. Human alteration of mesoclimates. Offered in alternate years.

***116. Climate Change** (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 3. Nature, magnitude, timing, and causes of climate change. Spatial and temporal climatic variations within the Quaternary emphasized. Offered in alternate years.

***117. Quaternary Environments** (3) I. Elliott-Fisk
Lecture—3 hours. Prerequisite: course 1 or Biological Sciences 1A or consent of instructor. Introduction to the character, timing, and magnitude of environmental changes during the Quaternary (Pleistocene and Holocene). Analysis of methods of paleo-environment identification. Survey of the Quaternary record for selected regions.

118. Mountain Geocology: Physical Geography (4) II. Ives
Lecture—3 hours; term paper. Prerequisite: course 1 or other introductory natural science course. Broad

overview of world mountain systems, including tectonics and structure, climate and vegetation, geomorphic processes and natural hazards. Will integrate relevant section of cognate disciplines to focus on three-dimensional character of mountain regions — a physical geography of mountains.

***120. Deserts of California and the Southwest** (3) II. Jett
Lecture—3 hours. Prerequisite: courses 1 and 2 or the equivalent recommended. Physical and human geography of the Mojave, Sonoran, and Chihuahuan deserts of the U.S., the Colorado Plateau, and the southern Great Basin. Desert origins, climate, vegetation, and landforms. Cultures and histories of native tribes, Hispano-Americans, and Anglo-Americans. Offered in alternate years.

***120L. Field Excursion to Californian and Southwestern Deserts** (2) III. Jett
Fieldwork—60 hours minimum (1 week). Field excursion to examine physical and human geography of selected desert areas in California and/or Nevada, Arizona, and Utah. May be repeated for credit. Limited enrollment; preference given to students having completed course 120. (P/NP grading only.) Offered in alternate years.

***121. North America** (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Landscapes and lifeways in the United States and Canada, and the ways in which physical and human forces have contributed to their variety. Regional stresses within and between the two countries.

122A. Mexico and Central America (4) I. Bahre
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Environment, culture, and economy from Mexico to Panama and in the Caribbean. Emphasis on understanding the evolution of the diverse natural and cultural landscapes of Middle America. Approach will be cultural/historical and ecological. Offered in alternate years.

***122B. South America** (4) II. Bahre
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Environment, culture, and economy in the South American countries. Emphasis on understanding the evolution of the diverse natural and cultural landscapes of South America. The approach will be cultural/historical and ecological. Offered in alternate years.

***123. Western Europe** (3) I. The Staff
Lecture—3 hours. Prerequisite: courses 1 and 2 or consent of instructor. Geographic conditions and their relation to the economic, social, and political problems of the countries of Western Europe.

124. The Soviet Union and Eastern Europe (4) III. Dingemans
Lecture—3 hours; discussion—1 hour. Prerequisite: an introductory course in the social sciences; course 2 or 5 recommended. Human use of the land in the Soviet Union and Eastern Europe. Location and nature of resources, agriculture, industry, and cities. Emphasis on modification of traditional landscapes by the Soviet model of planning for regional development. General Education credit: Contemporary Societies.

125A. North Africa and the Middle East (4) II. Grivetti
Lecture—4 hours. Prerequisite: courses 1 and 2, or consent of instructor. Geography of the Islamic world of North Africa and Southwest Asia; climatic and physical features; cultural areas, settlement patterns, and the influence of Islam; economic patterns and development.

***125B. Sub-Saharan Africa** (3) II. The Staff
Lecture—3 hours. Prerequisite: courses 1 and 2, or consent of instructor. Physical, cultural, and historical geography of Africa south of the Sahara.

***126. Southern Asia** (3) I. Allan
Lecture—3 hours. Prerequisite: courses 1 and 2, or consent of instructor. Physical, cultural, and historical geography of Southern Asia. Offered in alternate years.

***127. Contemporary East Asia** (4) III. Dingemans
Lecture—3 hours; discussion—1 hour. Prerequisite: introductory course in the social sciences; course 2 or 5 recommended. Human use of the earth in East Asia. Location and nature of resources, agriculture, industry, and cities. Modernization of traditional rural and urban landscapes. Emphasis on contemporary China and Japan as contrasting paths to economic development.

***131. California** (4) III.

Lecture—3 hours; discussion—1 hour. The regional nature and variety of California: landforms, climates, vegetation, and soils; water, agriculture, and the cities. Ecological problems caused by increasing population and technological pressures on these environments.

141. Organization of Economic Space (4) I.

Momsen

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. Survey of the principal environmental, economic, social, political, and cultural forces contributing to the regionalization of the world's economic activities. Outline of the more important regional patterns resulting from the interplay of these forces. Emphasis will also be put on these aspects as they pertain to the problems of regional disparities both within and between nations.

142. Geography of Agriculture (4) II. Momsen

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. Distribution and areal variety of the world's food-producing areas, and the ways physical, historical, cultural, and economic factors have influenced these aspects of agriculture. Current and future trends and associated resource problems.

143. Political Geography (4) I. Dingemans

Lecture—3 hours; term paper. Areal differentiation of major natural and cultural phenomena affecting the world's political organization.

151. History of Geographic Thought (4) III. Momsen

Lecture—3 hours; term paper. Prerequisite: three upper division courses in geography. The literature of geography: objectives, subdivisions, and development of the subject.

155. Urban Geography (4) II. Dingemans

Lecture—3 hours; term paper. Prerequisite: course 5 or consent of instructor. Geography of land use within cities. The processes of change, and theories of economic and social organization of urban space. The urban landscape as a product of history, planning policy, transportation systems, and residential structure. General Education credit: Contemporary Societies.

156. The Urban Region (4) III. Dingemans

Lecture—3 hours; term paper. Prerequisite: course 5 or consent of instructor. Location and functional interdependence of cities. Relations between city and hinterland, including labor shed, service area, and economic base. Role of urbanization in regional development.

***160. World Resource Patterns** (3) I. The Staff

Lecture—3 hours. Prerequisite: upper division standing. Principal world patterns of resource distribution. Concentrations and voids, and their significance for economic development and the welfare of the state. Focus on both natural and human resources of the geographic complex. Resource status of main economic regions.

161. Conservation of Resources and Environment (4) I. Jett

Lecture—4 hours. Principles of natural-resource and environmental-quality conservation. Land use conflicts between forestry, agricultural, mining, municipal, and recreational interests. Roles of industry, government, and society in creating and resolving resource and environmental problems.

162. Geography of Water Resources (4) III. Shelton
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Geographical survey of water on the land; needs and opportunities for water-resource development and conservation. Historical solutions to water

needs of specific areas, and geographical problems associated with current and future water requirements.

168. Mountain Geoecology: Human Geography (4) III. Allan

Lecture—3 hours; term paper. Prerequisite: course 118, or consent of instructor. Analysis of traditional adaptations of mountain cultures to their habitats; resource use and environmental degradation; tourism impacts and Third World development issues. Emphasis on Himalayas; also Andes, Alps, and Rocky Mountains, providing historical perspective and discussion of current environmental crises.

***170. Cultural Ecology** (4) I, II. Jett

Lecture—3 hours; term paper. Prerequisite: course 2 or Anthropology 2. Geographic theories of environmental relations. Ecologic relations of gatherers, fishermen, hunters, cultivators, and urbanites; their environmental impacts; their domestic plants and animals. General Education credit: Contemporary Societies.

171. Cultural Geography (4) I. Jett

Lecture—3 hours; term paper. Prerequisite: course 2 or consent of instructor. Consideration of principal concepts and approaches in cultural geography in modern times, and links with, and parallels in, other disciplines. General Education credit: Contemporary Societies.

***172. Animals and Culture History** (4) III. The Staff

Lecture—4 hours. Prerequisite: course 2, Anthropology 2, or consent of instructor. Theories of animal domestication; spread of domesticated animals in Old and New Worlds; contrasting roles of domesticated animals in human ecology through time; pastoral nomadism and other animal-based economies.

***173. Humans and Vegetation Change** (4) III. Bahre

Lecture—3 hours; term paper. Prerequisite: course 1 or Biological Sciences 1A, or consent of instructor. Role of humans in modifying the earth's vegetation. Emphasis on cultural plant geography, factors of plant distribution, classification and mapping of vegetation, world vegetation patterns, human impact on major regions, and case studies of land use and vegetation change.

***175. Geography of Food and Diet** (4) II. Grivetti

Lecture—4 hours. Prerequisite: course 2 or Anthropology 2; Nutrition 20 recommended. Consideration of the cultural and environmental factors that influence dietary practices; historical development of food habits; food use in different economic systems, both traditional and contemporary. Offered in alternate years.

192. Student Internship in Geography (2-4) I, II, III. The Staff

Internship—5-15 hours at employing agency; term paper. Prerequisite: consent of undergraduate Geography major adviser and consent of instructor. Supervised program of student internships with public agencies dealing with geographical problems. The application and evaluation of theoretical concepts through work experience with a variety of assignments and work schedules. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

200. Research Trends in Geography (1) I. The Staff (Chairperson in charge)

Seminar—1 hour. Major current research themes and trends in geography. (S/U grading only.)

201. Sources and General Literature of Geography (4) I, II, III. The Staff

Discussion—4 hours. Prerequisite: graduate status in geography; consent of instructor. Designed for students preparing for higher degrees in geography. May be repeated for credit in one or more of the following subfields: physical, cultural, economic, urban, historical, political, conservation, and regional geography.

202. Arctic and Alpine Environments (4) III. Ives
Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: course 118 or consent of instructor. Analysis of cold climate processes in high latitudes and high altitudes. Interdisciplinary evaluation of arctic and alpine environments; including glaciation and permafrost, vegetation development and landscape change through time; effects of climatic change. Offered in alternate years.

290. Seminar: Selected Regions (4) III. Allan
Seminar—3 hours. Region to be announced annually.

***291. Seminar in Cultural Geography** (4) III. Jett
Seminar—3 hours.

292. Seminar in Plant Geography (4) I. Bahre
Seminar—3 hours; seminar paper. Prerequisite: graduate standing. Examination of that aspect of cultural plant geography dealing with human impacts and vegetation change in the earth's major biomes. Particular emphasis on the New World's savannas, deserts, and grasslands. Offered in alternate years.

***294. Seminar in Climatology** (4) II. Shelton
Seminar—3 hours.

***295. Seminar in Urban Geography** (4) I. Dingemans
Seminar—3 hours.

296. Seminar in Agricultural Geography (4) II. Momsen
Seminar—3 hours.

298. Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Individual Study (1-12) I, II, III. The Staff
Prerequisite: graduate student status in Geography and consent of instructor. (S/U grading only.)

Geology

(College of Letters and Science)

Howard W. Day, Ph.D., Chairperson of the Department

Department Office, 174 Physics-Geology Building
(916-752-0350)

Faculty

William H. Casey, Ph.D., Associate Professor (*Land, Air and Water Resources*)

Sandra J. Carlson, Ph.D., Assistant Professor

Richard Cowen, Ph.D., Senior Lecturer

Robert E. Criss, Ph.D., Professor

Howard W. Day, Ph.D., Professor

James A. Doyle, Ph.D., Professor (*Evolution and Ecology*)

Graham E. Fogg, Ph.D., Associate Professor (*Land, Air, and Water Resources*)

Anne M. Hofmeister, Ph.D., Associate Professor

Louise H. Kellogg, Ph.D., Associate Professor

Charles E. Leshner, Ph.D., Assistant Professor

James S. McClain, Ph.D., Associate Professor

Eldridge M. Moores, Ph.D., Professor

Jeffrey F. Mount, Ph.D., Professor

Peter Schifman, Ph.D., Professor

Philip W. Signor, Ph.D., Associate Professor

Howard J. Spero, Ph.D., Assistant Professor

Robert J. Twiss, Ph.D., Professor

Geerat J. Vermeij, Ph.D., Professor

Kenneth L. Verosub, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*

Emeriti Faculty

Charles G. Higgins, Ph.D., Professor Emeritus

Robert A. Matthews, A.B., Senior Lecturer Emeritus

The Major Programs

"Civilization exists by geological consent—subject to change without notice."

Will Durant

Geology is the study of the Earth, and in particular the history, the structure, the evolution of life, and the processes that have molded the Earth and its inhabitants. The coming of the space age has also extended the field to include the solid planets of the solar system. Although often attracted to the study of geology by an aesthetic appreciation and enjoyment of the earth, geologists commonly approach their studies from an interest either in the academic or the applied aspects of the science.

The academic aspects include the study of the history of life, the Earth, and the planets, and of the processes that drive the historical evolution. It is the study of this historical evolution through "deep time" that fundamentally distinguishes geology from most of the other physical sciences. The study of the processes that drive this evolution can involve the application of any of the physical or life sciences to understanding the Earth. In this sense, geology is truly an interdisciplinary science.

The applied aspects of the science generally involve the interaction between humans and the earth. Applied studies include the study of mineral resources including oil and water; identification and mitigation of Earth hazards such as earthquakes, landslides, and volcanic eruptions; identification and mitigation of polluted ground water; and land use planning.

The Program. Students interested in becoming professional geologists or continuing their geological studies at the graduate level should elect the Bachelor of Science degree program. The Bachelor of Arts program is designed for students interested in an interdisciplinary program of study, or who plan to go into pre-college teaching. Both programs include twelve units of upper division electives that provide students an opportunity to emphasize an aspect of the field of particular interest to them. The electives are not restricted to geology courses but must be chosen to provide a relevant, coherent, and in-depth program of study which must be approved by an undergraduate advisor before they are taken. Transfer students should have completed as much as possible of the "preparatory subject matter" listed below. High school preparation for either program should include high school chemistry and four years of mathematics or the equivalent.

Internships and Career Alternatives. The largest employer of geologists has traditionally been the oil industry, although recently more opportunities have been available in environmental geology with consulting firms and government agencies. Government organizations and research laboratories also employ geologists in a variety of other capacities. There is a growing need for earth science teachers at all pre-college levels, and colleges and universities provide opportunities in teaching and research. Entry level positions are available with a Bachelor's degree. A Master's degree is the usual professional level degree, and a Ph.D. is generally required for research and academic positions. Internships during undergraduate training are a means of exploring potential career opportunities and can lead to positions after graduation. Davis students have interned at the California Division of Mines and Geology, the State Department of Water Resources, and various consulting firms.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	44-45
Geology 3, 3L, 50, 50L, 60, 60L	14
Mathematics 16A-16B-16C or 21A-21B	8-9
Chemistry 2A-2B or 2AH-2BH	10
Physics 5A-5B-5C	12
Depth Subject Matter	39
Geology 102, 105, 105L, 106, 110, 110L, 122, 123	27

Additional upper division electives chosen from upper division courses in geology. Upper division courses in related fields may satisfy this requirement if approved *in advance* by the major adviser12

Total Units for the Major.....**83-84**

Recommended

Chemistry 2C or 2CH; Geology 3, 3L; Statistics 13 or 102.

B.S. Major Requirements:

UNITS

Preparatory Subject Matter	56
Geology 3, 3L, 50, 50L, 60, 60L	14
Mathematics 21A-21B-21C	12
One course chosen from Mathematics 22A, 22B, 21D, Statistics 32, 102	3-4
Chemistry 2A-2B-2C; or preferably 2AH-2BH-2CH	15
Physics 9A-9B-9C or 5A-5B-5C	12

Depth Subject Matter

Geology 102, 105, 105L, 106, 110, 110L, 118, 122, 123	35
Geology 190 (repeat course at least once) ...	2
One course chosen from Geology 124, 125	5
Additional upper division electives chosen from selected courses in geology and related fields approved <i>in advance</i> by major adviser (see adviser for list of approved courses)	12

Total Units for the Major.....**110-111**

Recommended

Electives for general geology emphasis: Geology 108, 108L, completion of 124, 125 sequence plus one other course (consult adviser).

Additional recommended courses: one or more of the following courses, depending on emphasis in geology: Mathematics 21D, 22A, 22B, Statistics 104, 106, 108, 110.

Major Advisers. A.B. degree: R. Cowen; B.S. degree: R. Cowen, L.H. Kellogg, R.J. Twiss.

Minor Program Requirements:

Students in other disciplines may elect to complete a minor in Geology by choosing a geological subject emphasis listed below. On transcripts the minor will appear as a minor in *Geology*.

UNITS

General Geology emphasis	22
Geology 50 and 50L (or 1, 1G, and 1L)	5
Geology 105, 105L, 106	9
Geology 108 and 108L or 107 and 107L	5
Geology 113, 115, or 116	3

Minor Advisers. R. Cowen, R.J. Twiss.

Engineering Geology emphasis

Geology 50 and 50L	5
Civil Engineering 171, 171L	5
Three courses chosen from Geology 117A, 117B, 134, Hydrologic Science 103, 145, Soil Science 118, 120,	9-12

Minor Adviser. R.J. Twiss

Geochemistry emphasis.....

Chemistry 110A, 110C	6
(Chemistry majors must substitute one of the elective courses for Chemistry 110C.)	
Geology 60, 60L, 115, 180	9
One elective course chosen from Chemical Engineering 151, Chemistry 126, Engineering 130, 134, Geology 150A, Hydrologic Science 136, Soil Science 102...3-5	

Minor Adviser. R.E. Criss.

Geomorphology emphasis (Minor under revision; see adviser).....

Geology 50 and 50L (or 1, 1G, and 1L)	5
Geology 152 or Geography 106	4
Geology 153 or Geography 108	4
Geology 135 or 154	3

At least six additional units chosen from Civil Engineering 171, 171L; Geography 112, 117, 118; Soil Science 118, 120; Hydrologic Science 141 or Civil Engineering 142

Minor Adviser. R. Cowen, R.J. Twiss.

Oceanography emphasis

Geology 106, 116, 150A, 150B, 150C	17
One course chosen from Environmental Studies 100, 151, Geology 111A, 111B, S119, Hydrologic Science 136	3-8

Minor Adviser. H.J. Spero.

Paleobiology emphasis

Geology 107 and 107L	5
Geology 111A or 111B; 145 or 146	7
At least six additional units from the following: Anthropology 151 or 152, Botany 116, 140 Genetics 103, Geology 111A, 111B, 145, 146, 150C, Zoology 105, 112, 125, 148	6-9

Minor Adviser. R. Cowen.

Interdisciplinary minors. The Geology Department administers two interdisciplinary minor programs, **Environmental Geology** and **Geophysics**, which may be completed by students majoring in any discipline including Geology. Programs for these minors are listed separately in this catalog in alphabetical order. For Geology majors, one course at most from these minor programs can be counted toward satisfaction of the Geology degree requirements.

Teaching Credential Subject Representative. R. Cowen. See also under Teacher Education Program.

Graduate Study. The Department of Geology offers a program of study and research leading to the M.S. and Ph.D. degrees. For information regarding graduate study in geology, address the Graduate Adviser, Department of Geology.

Graduate Advisers. J.F. Mount, J.S. McClain, P. Schiffman.

Courses in Geology (GEL)

Lower Division Courses

1. The Earth (3) I. Cowen; II. Signor; III. Verosub
Lecture—3 hours. Introduction to study of the Earth for those not majoring in geology or associated sciences. Not open for credit to students who have taken course 50. General Education credit with concurrent enrollment in course 1G: Nature and Environment.

1G. Earth: Discussion (1) I. Cowen; II. Signor; III. Verosub
Discussion—1 hour. Prerequisite: course 1 concurrently. Small group discussions and preparation of short papers for course 1. General Education credit with concurrent enrollment in course 1: Nature and Environment.

1L. Earth Laboratory (1) I. Cowen; II. Signor; III. Verosub
Laboratory—3 hours. Prerequisite: course 1 (preferably taken concurrently). Introduction to Earth materials (minerals and rocks), crustal deformation (faults and folds), landforms, and the processes that form them. Not open for credit to students who have taken course 50L.

3. History of Life (3) II. Cowen
Lecture—3 hours. Prerequisite: course 1 recommended. The history of life during the three and one-half billion years from its origin to the present day. Origin of life and processes of evolution; how to visualize and understand living organisms from their fossil remains. General Education credit with concurrent enrollment in course 3G: Nature and Environment.

3G. History of Life: Discussion (1) II. Cowen
Discussion—1 hour. Prerequisite: course 3 concurrently. Small group discussion and preparation of short papers for course 3. General Education credit with concurrent enrollment in course 3: Nature and Environment.

3L. History of Life Laboratory (1) II. Cowen
Laboratory—3 hours. Prerequisite: course 3 (concurrently). Exercises in understanding fossils as the clues

*Course not offered this academic year.

to interpreting ancient life, including their functional morphology, paleoecology, and evolution.

12. Evolution and Paleobiology of Dinosaurs (2) III. Cowen

Lecture—2 hours. Introduction to evolutionary biology, paleobiology, ecology and paleoecology, using dinosaurs as case studies.

17. Earthquakes and Other Earth Hazards (2) I. Verosub

Lecture—2 hours. The impact of earthquakes, volcanoes, landslides and floods on Man, his structures and his environment. Discussion of the causes, effects, and solution of geologic problems in rural and urban settings.

20. Geology of California (2) II. Moores

Lecture—2 hours; demonstration—1 hour. The geologic history of California, the origin of rocks and the environments in which they were formed, the structure of the rocks and the interpretation of their structural history, mineral resources, and appreciation of the California landscape.

43. Form, Function, and Evolution: The Molluscan Shell (3) II. Vermeij

Lecture/discussion—2 hours; term paper. Prerequisite: course 1, 3, or Biological Sciences 10. Evolutionary principles relating form, function, and environment are explained through the study of shells of living and fossil molluscs. Topics include shell geometry, mechanical design, adaptation to enemies, and the distribution of shell architectural types in space and time. General Education credit: Nature and Environment.

50. Physical Geology (3) II. McClain

Lecture—3 hours. Prerequisite: high school physics and chemistry. The Earth, its materials, its internal and external processes, its development through time by sea-floor spreading and global plate tectonics. Students with credit for course 1 or the equivalent may receive only 2 units for course 50.

50L. Physical Geology Laboratory (2) II. McClain Laboratory—6 hours; one or two one-day field trips. Prerequisite: course 50 (preferably taken concurrently). Introduction to classification and recognition of minerals and rocks and to interpretation of topographic and geologic maps and aerial photographs. Students with credit for course 1L or the equivalent may receive only 1 unit for course 50L.

60. General Mineralogy (3) I. Hofmeister

Lecture—3 hours. Prerequisite: Chemistry 2A or 2AH. Crystallography; physical and chemical structure and properties of minerals; mineral genesis.

60L. General Mineralogy Laboratory (2) I. Hofmeister

Laboratory—6 hours. Prerequisite: course 60 (preferably taken concurrently). Morphological crystallography; stereographic projection; identification of the common rock-forming minerals.

99. Special Study for Undergraduates (1-5) I, II, III.

The Staff (Chairperson in charge) Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

102. Field Geology (5) III. Leshner

Lecture—1 hour; laboratory—2 hours; field study—8 full days. Prerequisite: course 105L, 106, 123 (may be taken concurrently); course 124 or 125 recommended. Instruction in geologic mapping techniques; field geologic study of selected areas to expose students to a variety of geologic features. Preparation of geologic maps, cross-sections, stratigraphic sections, and descriptions of geologic rock units is required (30 hours minimum).

105. Structural Geology (3) II. Moores

Lecture—3 hours. Prerequisite: courses 50-50L; Physics 5A or 9A; Mathematics 21A, 21B recommended. Description and origin of the deformational features of the earth's crust. Brittle deformation, stress, faults and fractures; ductile deformation, strain, folds and foliations. Experimental rock deformation.

105L. Structural Geology Laboratory (2) II. Moores Laboratory—6 hours; fieldwork—three 1-day field trips. Prerequisite: course 50L or consent of instructor; course 105 concurrently; high school trigonometry and geometry. Graphical and trigonometric solutions to structural problems; introduction to field methods and field mapping; interpretation of geologic maps.

106. Ancient Environments (4) I. Mount

Lecture—3 hours; laboratory—3 hours (includes 3 one-day field trips). Prerequisite: courses 50, 50L. Study of modern and ancient environments from continents, coasts, shelves and deep oceans. Ecology of fossils, sedimentary processes; stratigraphy, identification of diagnostic rock types, geological map making; recognition of ancient environments.

107. Principles of Paleobiology (3) III. Cowen

Lecture—3 hours. Prerequisite: courses 3-3L or Biological Sciences 1B. The evolution and ecological structure of the biosphere from the origin of life to the present.

107L. Principles of Paleobiology Laboratory (2) III. Cowen

Laboratory—6 hours. Prerequisite: courses 3-3L or Biological Sciences 1B; course 107 (may be taken concurrently). Exercises in determining the ecological functions and evolution of individuals, populations, and communities of fossil organisms in field and laboratory.

108. Regional Structure and Stratigraphy (3) III. Moores

Lecture—3 hours. Prerequisite: courses 105, 105L, 106. Global tectonic features and processes. Structure, stratigraphy, and evolution of large-scale features of the earth's crust; shield and platforms, continental margins, ocean basins, plate boundaries and mountain belts.

108L. Regional Structure and Stratigraphy Laboratory (2) III. Moores

Laboratory—6 hours; two one-day field trips. Prerequisite: course 108 (preferably taken concurrently). Illustration of topics covered in course 108. Emphasis on the interpretation of geologic history using geologic maps selected from a variety of structural and stratigraphic provinces.

***111A. Paleobiology of Invertebrata (4) I. The Staff** Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and ecology of the major phyla of invertebrates. Offered in alternate years.

***111B. Paleobiology of Protista (4) II. Spero** Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and ecology of single-celled organisms. Offered in alternate years.

113. The Solar System (3) III. The Staff

Lecture—3 hours. Prerequisite: one course in physical science. Nature of the Sun, Moon and planets as determined by recent manned and unmanned exploration of the solar system. Comparison of terrestrial, lunar, and planetary geologic processes. Search for life. Origin and evolution of the solar system. General Education credit with concurrent enrollment in course 113G: Nature and Environment.

113G. The Solar System: Discussion (1) III. The Staff

Discussion—1 hour. Prerequisite: course 113 concurrently. Small discussion groups and preparation of papers for course 113. General Education credit with concurrent enrollment in course 113: Nature and Environment.

114. Climates of the Past: Key to the Future (3) II. Spero

Lecture—3 hours. Prerequisite: Chemistry 2A or course 1 or Biological Sciences 1A or the equivalent. Analysis of present day evidence for climatic warming and the greenhouse effect with comparison to the history of Earth's climate fluctuations over the last 70 million years. Past and present climate records are used to examine potential future climatic scenarios.

***115. Geochemistry (3) I. Criss**

Lecture—3 hours. Prerequisite: Chemistry 2A (may be taken concurrently); course 50. Application of princi-

ples of solution, physical, structural, colloidal, and isotopic chemistry to geologic problems. Formation of carbonate rocks and other chemical sediments, rock weathering, and clay mineral formation. Magmatic, metamorphic, and hydrothermal processes and radiometric dating techniques.

116. The Oceans (3) I. Spero; II. Cowen and staff Lecture—3 hours. Prerequisite: upper division standing or consent of instructor. Introductory survey of the marine environment. Oceanic physical phenomena, chemical constituents, geological history, and the sea's biota; and utilization of marine resources. (Same course as Environmental Studies 116.) General Education credit with concurrent enrollment in course 116G: Nature and Environment.

116G. The Oceans: Discussion (2) I. Spero; II. Cowen and staff

Discussion—2 hours. Prerequisite: course 116/Environmental Studies 116 concurrently. Scientific method applied to discovery of the processes, biota and history of the oceans. Group discussion and preparation of papers. (Same course as Environmental Studies 116G.) General Education credit with concurrent enrollment in course 116: Nature and Environment.

117A. Exploration Geophysics and Seismology (3) I. The Staff

Lecture—3 hours. Prerequisite: Mathematics 21C, Physics 6C or 9C, or consent of instructor. Principles of exploration geophysics and seismology. Use of gravity, magnetic, electrical resistivity, electromagnetic, and seismic measurements to determine structure of the Earth's crust. Interpretation of data using computers. Survey of well-logging techniques. Seismology and earthquakes.

117B. Geophysics of the Solid Earth (3) II. Kellogg Lecture—3 hours. Prerequisite: Mathematics 21C, Physics 6C or 9C, or consent of instructor. Theory and use of physics in the study of the solid earth. Gravity, magnetism, paleomagnetism, and heat flow. Application to the interpretation of the regional and large-scale structure of the earth and to plate tectonics.

117C. Fluid Flow in the Earth (3) III. Kellogg Lecture—3 hours. Prerequisite: Mathematics 21C, Physics 6C or 9C, or consent of instructor. Principles of fluid flow as applied to problems in geological sciences. Flow in volcanic pipes and artesian springs. Porous flow in natural systems. Thermal convection. Convection in the earth's mantle and in the oceans.

118. Summer Field Geology (8) Extra-session summer. The Staff

Six weeks in field. Prerequisite: course 102. Preparation of a geologic map and report on a selected field area.

***119. Field Studies in Marine Paleocology (9) Summer. Farmer**

Lecture—12 hours; laboratory—25 hours. Prerequisite: one course in biology or geology and consent of instructor. Lectures and field-laboratory studies of physical and biological aspects of nearshore marine environments, and the reconstruction of ancient environments through the study of fossil assemblages and sedimentary rocks in nearby coastal areas. Full time residence at Bodega Marine Laboratory is required. A \$25.00 lab fee is required.

120. Volcanoes (4) II. Schiffman

Lecture—3 hours; discussion/laboratory—3 hours. Prerequisite: upper division standing and course 1 or 50. Study of how volcanoes, their eruptions, and their eruptive products shape our planet's crust, influence its oceans, atmosphere, and biota, and provide essential human resources, including mineral deposits and geothermal energy.

122. Optical Mineralogy (3) II. Day

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 60, 60L or consent of instructor. Optical properties of crystals and techniques of mineral identification with the petrographic microscope.

123. Igneous Petrology (5) III. Leshner

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 122. Origin and occurrence of igneous rocks. Laboratory exercises emphasize the study of these rocks in hand specimen and thin section.

124. Sedimentary Petrology (5) II. Mount

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 122. Origin and occurrence of sedimentary rocks. Laboratory exercises emphasize the study of these rocks in hand specimen and thin section.

125. Metamorphic Petrology (5) I. Day

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 122; course 123 recommended. Occurrence and origin of metamorphic rocks. Laboratory exercises emphasize the study of these rocks in hand specimen and thin section.

130. Non-Renewable Natural Resources (3) III. Criss

Lecture—3 hours. Prerequisite: course 1. Origin, occurrence, and distribution of non-renewable resources, including metallic, nonmetallic, and energy-producing materials. Problems of discovery, production, and management. Estimations and limitations of reserves, and their sociological, political, and economic effects.

131. Earth Science, History, and People (4) I.

Cowen

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing; course 1. Study of interplay between the earth and its human inhabitants through history, including consideration of acute events like earthquakes and eruptions as well as the geology of resources, topography, and water. General Education credit: Nature and Environment.

134. Environmental Geology and Land Use Planning (3) II. The Staff

Lecture—3 hours. Geologic aspects of land use and development planning. Problems concerning waste disposal, land stability, earthquake prediction. Analytic techniques, presentation of reports, and legal aspects of selected case studies.

135. Rivers of California: Geology and Land Use

(3) III. Mount

Lecture—2 hours; discussion-laboratory—3 hours. Prerequisite: courses 1, and 1G or 1L. Analysis of the conflict between geologic processes and the urbanization and resource exploitation of California's watersheds. Mining, logging, and dam construction. Case studies of Sierra Nevada watersheds. Field study includes two raft trips on Sierran rivers and visit to Auburn Dam site. General Education credit: Nature and Environment.

***140. Geologic Data Collection and Report Presentation** (2) III. The Staff

Lecture—2 hours. Prerequisite: upper division standing and a major in Geology. Collection, organization and presentation of data for geologic reports. Participants will analyze published reports, write syntheses of published reports and write abstracts.

144. Evolution and the Fossil Record (4) II. Signor

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Patterns of evolution recorded in the geologic record. Models of organic evolution. Origination and extinction of taxa. The Neo-Darwinian synthesis and its impact on the interpretation of the fossil record. General Education credit: Nature and Environment.

***145. Paleocology** (3) II. Signor

Lecture—3 hours. Prerequisite: course 107. Principles and methods of environmental reconstruction of ancient animal and plant communities. Course includes statistical methods in paleocology; principles of biostratigraphy.

***146. Evolutionary Paleontology** (3) I. Vermeij

Lecture—3 hours. Prerequisite: course 107 or 110. Principles of evolution from the special perspective of the fossil record. Facts and inferences on the origin of species and higher taxa. Survey of adaptive radiations and major extinctions.

150A. Physical and Chemical Oceanography (4) I. McClain, Spero

Lecture—3 hours; discussion—1 hour. Prerequisite: course 116 or Environmental Studies 116; Physics 9B; Mathematics 21D; Chemistry 2C; or upper division standing in a natural science and consent of instructor. Physical and chemical properties of seawater, fluid dynamics, air-sea interaction, currents, waves, tides, mixing, major oceanic geochemical cycles. Offered in alternate years. (Same course as Environmental Studies 150A.)

150B. Geological Oceanography (3) II. McClain

Lecture—3 hours. Prerequisite: course 50 or 116. Introduction to the origin and geologic evolution of ocean basins. Composition and structure of oceanic crust; marine volcanism; and deposition of marine sediments. Interpretation of geologic history of the ocean floor in terms of sea-floor spreading theory. (Same course as Environmental Studies 150B.)

150C. Biological Oceanography (3) III. The Staff

Lecture—3 hours. Prerequisite: Biological Sciences 1A and a course in general ecology or consent of instructor. Survey of the ecology of major marine habitats including intertidal, shelf benthic, deep-sea, and plankton communities. Existing knowledge and contemporary issues in research will be equally stressed. A portion of the course will be devoted to man's use of and impact on the ocean. Offered in alternate years. (Same course as Environmental Studies 150C.)

***152. Photogeology and Remote Sensing** (4) II.

Higgins

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1L or 50L; course 105 recommended. Field use of aerial photographs: types and availability, stereoviewing, and basic geometry. Geological uses and interpretation of aerial photographs and of images obtained by remote sensing.

***153. Geomorphology** (4) II. Higgins

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 50-50L or 1-1L; Geography 1 recommended. Landforms, landscapes, and the processes that shape them. An introduction to geomorphic observation and theory. Alternates with and complements course 154. Offered in alternate years.

***154. Environmental Geomorphology** (3) II. Higgins

Lecture—3 hours. Prerequisite: courses 50-50L or 1-1L; Geography 1 recommended. Aspects of geomorphology that relate to Man's use of the natural environment. Alternates with and complements course 153. Offered in alternate years.

***162. Stress and Deformation** (4) II. Green

Lecture—3 hours; discussion—2 hours. Prerequisite: Mathematics 21C and Physics 9B; Mathematics 22A, 21D, and Physics 9C recommended. Introduction to tensor analysis: tensor notation transformations, representation quadric, Mohr-circle construction; stress, strain; strain-rates, elasticity. Solution of general, three-dimensional problems with geological application.

180. Sample Preparation and Techniques (1) II.

Winter

Laboratory—3 hours. Prerequisite: course 122. Introduction to petrographic laboratory techniques for petrographers. Topics covered may include thin and polished section preparation, rock crushing/grinding, mineral separation, staining, and photomicroscopy. (P/NP grading only.)

185. Advanced Field Geology (1-6) I, II, III. The Staff

Fieldwork—3-18 hours; report. Prerequisite: course 118 or graduate standing in Geology. Advanced problems and methods in geologic field studies; preparation of a geologic report. May be repeated for total of 6 units when different subject matter studied.

190. Seminar in Geology (1) I, II, III. The Staff

Discussion—1 hour; seminar—1 hour; written abstracts. Prerequisite: major in Geology. Presentation and discussion of current topics in geology by visiting lecturers, staff, and students. May be repeated for credit. (P/NP grading only.)

192. Internship in Geology (1-12) I, II, III. The Staff

(Chairperson in charge)
Internship. Prerequisite: upper division standing; project approval prior to internship. Supervised work experience in geology. May be repeated for credit for a total of 10 units. (P/NP grading only.)

194A-194B. Senior Thesis (3-3) I-II-III. The Staff

(Chairperson in charge)

Prerequisite: open to geology majors who have completed 135 units and who do not qualify for the honors program. Guided independent study of a selected topic, leading to the writing of a senior thesis. (Deferred grading only, pending completion of course sequence.)

194HA-194HB. Senior Honors Project (3-3) I, II, III.

The Staff (Chairperson in charge)

Independent study—9 hours. Prerequisite: open to Geology majors who have completed 135 units and who qualify for the honors program. Guided independent study of a selected topic, leading to the writing of an honors thesis. (Deferred grading only, pending completion of sequence.)

198. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge)

Prerequisite: senior standing in geology or consent of instructor.

199. Special Study for Advanced Undergraduates

(1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses**206. Stratigraphic Analysis** (3) III. Mount

Lecture—3 hours. Prerequisite: courses 105L and 106 or consent of instructor. Advanced historical geology; analysis of stratigraphy and geologic history of North America and selected parts of other continents. Emphasis on interpreting lithologic assemblages and stratigraphic relations in terms of modern tectonic-depositional models. Offered in alternate years.

***209. Origin and Significance of Metamorphic Textures** (4) III. Green

Seminar—3 hours; laboratory—3 hours. Interpretation of metamorphic textures in terms of surface energy anisotropy, growth anisotropy, crystal deformation processes, and disequilibrium phenomena. Offered in alternate years.

***213. Studies in Geomorphology** (3) I. Higgins

Lecture-seminar—3 hours. Prerequisite: course 153 or Geography 108. Topics selected from: studies of landforms and landscape development and of the action of formative processes, methods of analysis of geomorphic problems, development of geomorphic theory. Topics change from year to year. May be repeated three times for credit.

***215A. Geochronology** (3) II. Criss

Lecture—3 hours. Prerequisite: Chemistry 110A, or consent of instructor. Principles and applications of nuclear chemistry to geology, emphasizing radioactive dating methods. Topics include K-Ar, Rb-Sr, Sm-Nd and U-Th-Pb systems, and the age and origin of Earth, Lunar, and meteoritic materials. Offered in alternate years.

215B. Stable Isotope Geochemistry (3) II. Criss

Lecture—3 hours. Prerequisite: course 115, Chemistry 110A, Mathematics 22B, or consent of instructor. Principles of equilibrium and kinetic isotope fractionation and material balance with special application to the distribution of oxygen and hydrogen isotopes in natural systems. Topics include isotope hydrology geothermometry and paleotemperatures, igneous rocks and materials, and fluid-rock interaction. Offered in alternate years.

216. Tectonics (3) I. Moores

Seminar—3 hours. Prerequisite: course 108 or consent of instructor. Nature and evolution of tectonic features of the Earth. Causes, consequences, and evolution of plate motion, with selected examples from the Earth's deformed belts.

217. Topics in Geophysics (3) I. Kellogg

Lecture—1 hour; seminar—2 hours. Prerequisite: consent of instructor. Discussion and evaluation of current research in a given area of geophysics. Topic will change from year to year. May be repeated for credit.

***218A. Structural Analysis I: Macrofabrics** (3) II.

Twiss

Seminar—3 hours. Prerequisite: consent of instructor. Geometric and kinematic analysis and interpretation of mesoscopic and macroscopic geologic structures and fabrics; geometry of folding, superposed folding, and folded lineations; symmetry arguments in the interpretation of fabrics; determination of slip lines of deformation; regional structural synthesis. Offered in alternate years.

***218B. Structural Analysis II: Microfabrics** (4) III.

Green

Seminar—3 hours; laboratory—3 hours. Prerequisite: consent of instructor; course 218A recommended.

Microscopic structural aspects of deformed metamorphic rocks, emphasizing deformation features and the origin and significance of preferred crystallographic orientation. Offered in alternate years.

***219. Special Studies in Marine Geology and Paleocology** (6-9) Summer. Farmer

Discussion—5 hours; seminar—3 hours; laboratory—20 hours. Prerequisite: graduate standing or completion of course 119, and consent of instructor. Independent field and laboratory investigation of selected topics in marine geology and paleocology.

***220. Mechanics of Geologic Structures** (3) II. Twiss

Lecture—2 hours; seminar—1 hour. Prerequisite: course 162, or consent of instructor and course 105. Application of principles of continuum mechanics to understanding development of geologic structures such as folds, fractures, faults, dikes, cleavage, boudinage. Offered in alternate years.

***226. Advanced Sedimentation and Sedimentary Petrology** (4) III. Mount

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 124 or consent of instructor. Advanced petrographic and stratigraphic study of major sedimentary rock suites. Lecture emphasis on recognition and interpretation of the spatial and temporal variations in sedimentary rock textures and mineralogies. Laboratory focus on provenance and diagenesis. Subjects vary yearly. May be repeated for credit. Offered in alternate years.

***227. Stable Isotope Biogeochemistry** (3) III. Spero
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Application of stable isotope techniques to paleoclimatic, paleontologic, paleoceanographic, ecological and anthropological research problems. Emphasis on carbon, oxygen, nitrogen, hydrogen and sulfur stable isotopes.

***228. Marine Geology** (3) III.

Lecture—3 hours. Prerequisite: courses 106, 116, 150B, or consent of instructor. Critical discussions and review of selected topics in marine geology such as paleoceanography, biostratigraphy of the ocean basin, evolution of ocean basins and margins, and sea-bed mineral resources. Topics vary yearly. May be repeated twice for credit.

230. Advanced Mineralogy (3) II. Hofmeister

Lecture—3 hours. Prerequisite: introductory mineralogy and differential equations or consent of instructor. Crystallography and crystal chemistry of rock-forming mineral and high pressure phases. Mechanism of phase transformations, with emphasis on pressure-induced polymorphism. Effect of kinetics and diffusion on mineral behavior. Processes of exsolution, order/disorder, and crystallization. Offered in alternate years.

***231. Mineral Physics Seminar** (3) II. Hofmeister
Seminar—3 hours. Prerequisite: course 230. Critical review of selected topics in mineral physics (e.g., the earth's thermal state; elastic properties and equations of state; phase transitions and mantle petrology; earth's structure and its evolution; transport phenomena in the earth's interior). May be repeated for credit. Offered in alternate years.

***232. Spectroscopic Methods in the Geosciences** (3) II. Hofmeister

Lecture—3 hours. Prerequisite: course 230 or consent of instructor. Overview of spectroscopic methods used in mineralogy and geology. Theory and practice of the infrared technique. Use of symmetry to establish type and number of vibrational modes. Raman, optical, Mossbauer, EPR and NMR methods. Application of vibrational data to thermodynamic problems. Offered in alternate years.

***236. Inverse Theory in Geology and Geophysics** (3) III. McClain

Lecture—3 hours. Prerequisite: consent of instructor. Inversion of data for model parameters. Evaluation of parameter uncertainties. Linear and nonlinear problems for discrete and continuous models. Bakus-Gilbert inversion. Offered in alternate years.

238. Theoretical Seismology (3) III. McClain

Lecture—3 hours. Prerequisite: consent of instructor. Elastodynamic wave equation. Greens functions and source representations. Ray theory. Plane and spherical waves and boundary conditions. Elastic wave propagation in stratified media. (P/NP grading only.) Offered in alternate years.

***240. Geophysics of the Earth** (3) I. Kellogg

Lecture—3 hours. Prerequisite: Earth Sciences and Resources 201, Physics 9B, Mathematics 22B. Physics of the earth's crust, mantle, and core. Laplace's equation and spherical harmonic expression of gravity and magnetic fields. Elastic wave equation in geologic media. Body and surface seismic waves. Equations of state, thermal structure of the earth. Offered in alternate years.

***241. Geomagnetism** (3) I. Verosub

Lecture—3 hours. Prerequisite: graduate standing. Nature and origin of the Earth's magnetic field. Present field and recent secular variation. Spherical harmonic analysis. Paleosecular variation. Polarity transitions and geomagnetic excursions. Statistics of polarity intervals. Dynamo theory. Planetary magnetism. Offered in alternate years.

242. Paleomagnetism (3) I. Verosub

Lecture—3 hours. Prerequisite: graduate standing. Principles and applications of paleomagnetism. Physical basis of rock and mineral magnetism. Field and laboratory techniques. Instrumentation. Analysis of paleomagnetic data. Statistical methods. Rock magnetic properties. Geological and geophysical applications. Offered in alternate years.

***245. Metamorphic Petrology** (5) I. Day

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 125 or consent of instructor. Metamorphic processes; origin and characteristics of metamorphic rocks; laboratory study of representative rock suites in hand specimen and thin section. Offered in alternate years.

246. Physical Chemistry of Metamorphic Processes (3) II. Day

Lecture—3 hours. Prerequisite: course 125, Chemistry 110A, or consent of instructor. Physicochemical principles of metamorphic mineral assemblages and methods of interpreting the paragenesis of metamorphic rocks. Offered in alternate years.

***247. Metamorphic Petrology Seminar** (3) II. Day

Seminar—3 hours. Prerequisite: course 245; course 246 recommended. Selected topics in metamorphic petrology (e.g., mass transport processes, tectonic settings, geothermometry, thermal structure of metamorphic belts, regional studies). May be repeated for credit when topic is different. Offered in alternate years.

***250. Advanced Geochemistry Seminar** (3) I. Criss
Seminar—3 hours. Prerequisite: course 115 or consent of instructor. Critical review of selected topics in geochemistry including: ore genesis, hydrothermal and geothermal fluids, recent and ancient sediments, isotope geology, origin and chemistry of the oceans. Subject varies yearly depending on student interest. May be repeated for credit. Offered in alternate years.

***254. Phase Equilibria** (3) I. The Staff

Seminar—3 hours. Prerequisite: Chemistry 2C and Mathematics 22A; physical chemistry recommended. Physicochemical aspects of the phase relations in silicate systems and their application to the petrogenesis of igneous and metamorphic rocks.

260. Paleontology (3) I. Signor; II. Vermeij; III. The Staff

Seminar—3 hours. Prerequisite: graduate standing in geology or a biological science. Selected problems in paleontology. Subject to be studied will be decided at an organizational meeting. May be repeated for credit when topic varies.

***263. Functional Morphology of Fossil Invertebrates** (4) III. Cowen

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 111A or Zoology 112. Principles and methods of functional analysis of fossils, with special reference to selected problems in invertebrate phyla. Offered in alternate years.

***269. Evolutionary Biology of Protista** (3) II. The Staff

Seminar—3 hours. Prerequisite: course 111B. Analysis and discussion of selected topics on the evolution of single-celled organisms with emphasis on their fossil record and biology. Offered in alternate years.

280. Igneous Petrology (3) I. Leshner

Seminar—2 hours; laboratory—3 hours. Prerequisite: course 123. Integrated laboratory, field study, and seminar on igneous processes and products.

282. Geological X-Ray Spectrometric Analysis (4) III. Schiffman

Lecture—3 hours; laboratory—3-4 hours. Prerequisite: course 60, Chemistry 2C or 2CH, Physics 9D, graduate standing in Geology. Theory of generation and detection of x-rays as applied to analytical chemistry of rocks and minerals. Laboratory sessions on use of the x-ray fluorescence spectrometer, electron microprobe, and x-ray diffractometer.

290. Seminar in Geology (1) I, II, III. The Staff

Seminar—1 hour; discussion—1 hour. Presentation and discussion of current topics in geology by visiting lecturers, staff, and students. (S/U grading only.)

291. Geology of the Sierra Nevada (1) III. Day

Seminar—one day-long session. Prerequisite: consent of instructor. Short oral presentations by students and faculty concerning results of their past work and plans for future work in the Sierra. A written abstract is required following the format required at professional meetings. (S/U grading only.)

***295. Advanced Problems in Geodynamics** (3) III. Twiss

Seminar—3 hours. Prerequisite: course 105 or consent of instructor. Seminar dealing with problems in geodynamics. Topics will vary (e.g., ductile deformation mechanisms, brittle fracture, earthquake prediction, driving forces for plate tectonics, mantle convection). Emphasis on recent literature. May be repeated for credit. (S/U grading only.) Offered in alternate years.

***296. Advanced Problems in Tectonics** (3) II. Moores

Seminar—3 hours. Prerequisite: course 108 or consent of instructor. Seminar dealing with current problems in tectonics of selected regions. Topics will change from year to year. Emphasis on study of recent literature. May be repeated for credit. (P/NP grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

390. Methods of Teaching Geology (1) I. Staff
Discussion—1 hour. Prerequisite: graduate student standing in Geology. Discussion of methods and problems of teaching geology. Topics include departmental facilities, grading efficiency/effectiveness, Teaching Assistant/student interaction, and teaching techniques for lecturing, discussions, and labs. Participation in teaching program required for Ph.D. in Geology. (S/U grading only.)

Geophysics

(College of Letters and Science)

Geophysics is study of the physical properties and processes within and surrounding the Earth. Many problems in the Earth Sciences require geophysical techniques for study. The interdisciplinary minor in geophysics is designed for students with backgrounds in the physical sciences, engineering and other fields who are interested in pursuing a graduate or professional career in geophysics, or who require a significant knowledge in the field. The curriculum reflects the need for such students to have a firm foundation of geophysics classes, as well as the

vast diversity of subdisciplines from many departments that are included in geophysics. The minor is sponsored by the Department of Geology, 174 Physics/Geology Building.

Minor Program Requirements:

	UNITS
Geophysics	21-24
Engineering 5	3
Geology 117A, 117B	6
Applied Science Engineering 115	3
One course sequence chosen from the following:.....	9-12
a. Atmospheric Science 120, 191A, 191B;	
b. Electrical and Computer Science Engineering 112, 151, 161;	
c. Geology 105, 162, Physics 105C;	
d. Mathematics 128A, 128B, 128C;	
e. Physics 104A, 104B, 105C.	

Minor adviser. J.S. McClain, Department of Geology, 275A Physics/Geology, 752-7093.

German

(College of Letters and Science)

Winder McConnell, Ph.D., Chairperson of the Department

Department Office (German and Russian), 422 Sproul Hall (916-752-2114)

Faculty

- Clifford A. Bernd, Dr.Phil., Professor
- Gail Finney, Ph.D., Professor
- Ingeborg Henderson, Ph.D., Senior Lecturer, *Academic Senate Distinguished Teaching Award*
- Anna K. Kuhn, Ph.D., Professor
- Winder McConnell, Ph.D., Professor
- Karl R. Menges, Dr.Phil., Professor
- Peter M. Schaeffer, Ph.D., Professor

Emeriti Faculty

- John F. Fetzer, Ph.D., Professor Emeritus
- Roland W. Hoermann, Ph.D., Professor Emeritus
- H. Guenther Nerjes, Ph.D., Professor Emeritus
- Fritz Sammern-Frankenegg, Dr.Phil., Lecturer Emeritus

The Major Program

The German major explores in depth the literature, language, and culture of the German-speaking world. The *General Program* is designed to accommodate specifically those students whose interest lies in literary studies, while the *Area Studies Emphasis* addresses the needs of students wishing to obtain a broader knowledge of the contributions of the German-speaking world to fields such as music, art, history, philosophy, and economics.

The Program. The department's primary emphasis on literary figures, movements and themes finds expression in the common core of upper division literature electives characterizing both programs. Beyond the common courses in advanced conversation and composition (101, 102 and 103) shared by students emphasizing area studies, literature, or language interests, those majors desiring maximum practice in spoken and written German, as well as in listening comprehension, will find opportunities for such exposure especially in any of the upper division literature courses that are offered in German.

Career Alternatives. Completion of the major will prepare the student for graduate study in German. Both programs (*general* and *area studies*) prepare students for career opportunities in fields such as international relations, business, the sciences, and the arts, as well as permitting admission to such professional curricula as law and medicine.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	8-23
German 1-2-3 (or the equivalent).....	0-15
German 4.....	4
German 51.....	4
Depth Subject Matter	48
General Program	
German 101.....	4
German 102.....	4
German 103.....	4
German 120.....	4
Three courses chosen from upper division literature offerings taught in German.....	12
Five additional upper division courses selected from 104-109 and 121-198, upon the explicit advance approval of an undergraduate major adviser.....	20
The above category may be satisfied in part by one or more courses in Comparative Literature, in another national literature, or from German literature-in-translation offerings (110-119, 140-142C) upon consultation with, and advance approval of, the undergraduate major adviser.	

German Area Studies Emphasis

German 101, 102, 103.....	12
German 120.....	4
Three courses chosen from upper division literature courses that are taught in German.....	12
History 144.....	4
Four elective courses in accordance with student's interest.....	16
Courses chosen from at least two of the following three areas after consultation with and approval by adviser.	
Humanities: History 143, Philosophy 170, 175, 176, 177.	
Social Sciences: Economics 174, Geography 123, Political Science 117, 137.	
Fine Arts: Art 176C, 177A, 177B, Music 110A, 110C, 110D.	

Special consideration is also given to such courses in Comparative Literature as the 164 series, where pan-European movements influential upon German literature are at issue.

Total Units for the Major.....**48-70**

Minor Program Requirements:

The Department offers a German Language and Literature minor. In addition, individualized minor programs may be designed upon consultation with the undergraduate adviser.

Students are particularly encouraged to consider a minor that combines a coherent group of courses to emphasize area studies in German (i.e., German philosophy, the arts, history, political science, as well as literature). The purpose of the minor is to provide students with the opportunity to augment their training in other fields by acquiring proficiency in the German language and exposure to German literature and culture.

	UNITS
German Language and/or Literature	20-24
Choose courses numbered from German 100 through 109B and literature courses that are taught in German.....	20-24
One lower division course from German 48 to 52A, 52B, 52C may be counted.	

Major Adviser. P. Schaeffer.

Prerequisite Credit. Credit normally will not be given on the lower division level for a course that is the prerequisite of a course already successfully completed.

Honors and Honors Program. The honors program comprises two quarters of study under course 194A-194B, which will include a research paper. See also the University and College requirements.

Teaching Credential Subject Representative. I. Henderson. See also under the Teacher Education Program.

The Master of Arts Degree. The Department offers programs of study leading to the M.A. degree under both Plan I (thesis) and Plan II (comprehensive final examination). A minimum of 30 units is required for Plan I, and a minimum of 36 units for Plan II. Further information may be obtained by writing to the Department Chairperson or the Graduate Adviser.

The Degree of Doctor of Philosophy. The Department offers programs of study and research leading to the Ph.D. degree. The department's affiliation with the programs in Critical Theory and in Women's Studies provides the opportunity for students to prepare for the designated emphasis in Critical Theory (an interdisciplinary program in theories and methodologies in the Humanities and Social Sciences) or for the designated emphasis in Feminist Theory and Research (an interdisciplinary program focusing on theories and issues involving gender studies). Detailed information may be obtained by writing to the Department Chairperson or the Graduate Adviser.

Graduate Advisers. A. Kuhn, K. Menges.

Courses in German (GER)

Lower Division Courses

Course Placement: Students with two years of high school German normally continue in German 2; those with three years, German 3; those with four years, German 4.

1. Elementary German (5) I, II, III. Henderson in charge
 Discussion—5 hours; laboratory—two 1/2-hour sessions. Introduction to German grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed German 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1H. Elementary Honors German (5) I, II, III. Henderson in charge
 Lecture/discussion—5 hours. Prerequisite: overall high school GPA of 3.5 or GPA of 3.5 in German for students with prior knowledge of German. Accelerated and considerably expanded introduction to German language, short literary texts, and culture accompanied by computer-assisted grammar instruction. Material covered in courses 1H and 2H is the equivalent of that covered in courses 1, 2, and 3.

2. Elementary German (5) I, II, III. Henderson in charge
 Discussion—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of course 1 in areas of grammar and basic language skills.

2H. Elementary Honors German (5) I, II, III. Henderson in charge
 Lecture/discussion—5 hours. Prerequisite: completion of course 1H with minimum GPA of 3.3 or GPA of 3.5 for incoming students. Completion of the accelerated and expanded first-year program with special emphasis on four skills in a cultural context, literary texts, and computer-assisted grammar instruction.

3. Elementary German (5) I, II, III. Henderson in charge
 Discussion—5 hours; laboratory—1 hour. Prerequisite: course 2. Completion of grammar sequence and continuing practice of all language skills through cultural texts.

4. Intermediate German (4) I, II, III. Henderson in charge
 Recitation—3 hours. Prerequisite: course 3. (Course 4 may be taken concurrently with 6.) Review of grammatical principles by means of written exercises; expanding of vocabulary through readings of modern texts.

*Course not offered this academic year.

6. Conversational German (3) I, II, III. Henderson Discussion—3 hours. Prerequisite: course 3. Designed to develop intermediate language skills with special emphasis on communication and grammatical accuracy. Course 6 may be taken concurrently with course 4.

10. Basic Reading German (3) I. The Staff Discussion—3 hours. Intensive course for non-majors, providing reading proficiency of texts containing basic sentence patterns and standard general vocabulary. Outside preparation will focus on developing translation techniques with general texts.

11. Intermediate Reading German (3) II. The Staff Discussion—3 hours. Prerequisite: successful completion of course 10 or the equivalent. Continuation of course 10. Study of advanced reading grammar to gain proficiency with texts of intermediate difficulty. (P/NP grading only.)

12. Advanced Reading German (3) III. The Staff Discussion—3 hours. Prerequisite: successful completion of course 11 or the equivalent. Continuation of course 11, with specialized focus for upper-division and graduate students on individualized translation projects within each student's field of academic specialization. Systematic review of reading grammar in terms of advanced reading texts. (P/NP grading only.)

48. Myth and Saga in the Germanic Cultures (4) I. The Staff Lecture—3 hours; term paper. Knowledge of German not required. Reading in English translation from the Norse Eddas, the Volsung and Sigurd-Siegfried cycles, and the Gudrun lays; literary mythology in German Romanticism culminating in Wagner's "total artwork" concept and The Ring of the Nibelung cycle. May not be counted toward major in German. General Education credit: Civilization and Culture.

49. Freshman Colloquium (2) II. The Staff (Chairperson in charge) Seminar—2 hours. Prerequisite: open only to students who have completed 40 or fewer quarter units of transferable college-level work. Readings, discussion and written projects treating topics such as communist-capitalist tension in German literary culture; masculine "versus" feminine authorial consciousness; disintegration and reconstitution of language reflecting cultural transformation; exorcising post-holocaust national guilt and individual frustration—Germany's new European "mission."

50. Survey of German Culture (4) II. The Staff Lecture—3 hours; discussion—1 hour. Knowledge of German not required. Characteristic themes in the mainstream of German culture, from medieval intellectual and artistic achievements to the modern period. Study of major developments in arts and literature. Frequent short written reports and in-class expository presentations. General Education credit: Civilization and Culture.

51. Introduction to Literary Analysis (4) I. Menges Lecture—3 hours; discussion—1 hour. Knowledge of German not required. Introductory study of various genres of German literature with emphasis on the interrelationship between form and content and the impact on contemporary literary appreciation.

52A. Great Books of German Culture in English Translation: The Age of Faith (4) I. The Staff (Chairperson in charge) Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: course 50 recommended. The transformation of ideas resulting from the German cultural experience and its expression within the context of the general Western development from Charlemagne through medieval chivalry to Luther and Grimmelshausen. Knowledge of German not required. General Education credit: Civilization and Culture.

52B. Great Books of German Culture in English Translation: The Age of Reason (4) II. The Staff (Chairperson in charge) Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: course 50 recommended. The significant cross-currents in the history of ideas as these shaped the German cultural experience, from the Reformation and the waning Holy Roman Empire, through the Enlightenment and Lessing, to Weimar's

Classicism and its 19th-century transformations in Romantic Idealism. Knowledge of German not required. General Education credit: Civilization and Culture.

52C. Great Books of German Culture in English Translation: The Age of Relativity (4) III. The Staff (Chairperson in charge) Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: course 50 recommended. The conflict between European and individual consciousness and national cultural identity, from Büchner, Wagner and Nietzsche, through bourgeois and Freudian realism, to the post-World War ethical critiques of Mann, Brecht, Grass and Handke, culminating in capitalist-communist polarity and its resolution. Knowledge of German not required. General Education credit: Civilization and Culture.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge) Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Upper Division Courses

100. Intensive Conversational German (4) III. The Staff Discussion—4 hours. Prerequisite: course 4. Intensive conversational practice to achieve accurate pronunciation and language fluency.

101. Composition and Conversation (4) I, II, III. The Staff Discussion—3 hours; written reports. Prerequisite: course 4 or consent of instructor. Practice in short essay writing. Discussion based on readings from a variety of German texts.

102. Composition and Conversation (4) I, II, III. The Staff Discussion—3 hours; written reports. Prerequisite: course 101 or consent of instructor. Practice in short essay writing with an aim toward refinement and expansion of vocabulary. Discussion based on readings in a variety of German texts.

103. Writing Skills in German (4) I, II, III. The Staff Lecture—3 hours; term paper. Prerequisite: course 101. Practice in different kinds of writing, such as abstracts, correspondence, lecture summaries, analysis of or response to short literary texts.

104A. Translation (4) I. McConnell Discussion—3 hours; written reports. Prerequisite: course 102 or the equivalent. Exercises in German to English translation using literary and non-literary texts of different styles and linguistic difficulty.

104B. Advanced Translation (4) II. McConnell Discussion—3 hours; written reports. Prerequisite: course 104A or the equivalent. Exercises in German to English translation of literary and non-literary texts.

105. The Modern German Language (4) I. Benware Lecture/discussion—3 hours; laboratory—1 hour. Prerequisite: course 4; Linguistics 1 recommended. Introduction to the linguistic analysis of contemporary German, including its phonology, morphology, syntax and semantics, as well as sociolinguistic considerations.

106. History of the German Language (4) II. Benware Discussion—3 hours; written reports. Prerequisite: course 102; course 105 or Linguistics 1 recommended. Survey of the development of the German language and study of its structure in historical perspective.

107. Modern German Syntax (4) III. Benware Discussion—3 hours; term paper. Prerequisite: course 102 or the equivalent or consent of instructor; Linguistics 1 recommended. Examination of the major problems in describing modern German sentence structure.

108. Varieties of Contemporary German (4) I. Benware Lecture—3 hours; laboratory and/or individual/group consultation on projects. Prerequisite: courses 102,

105. Study of relations between Standard language, *Umgangssprachen* and dialects. Approach is both descriptive and sociolinguistic. Class or individual projects on regional differences, including all of the contiguous German-speaking area of Europe.

109A. Business German (4) II. Henderson Lecture/discussion—4 hours. Prerequisite: course 101 or consent of instructor. Specialized advanced language course using business-oriented information and publications as the basis for discussions, role-play, reports, compositions and translations.

109B. Advanced Business German (4) III. Henderson Lecture/discussion—3 hours; laboratory/discussion—1 hour. Prerequisite: course 109A or consent of instructor. Specialized advanced language course designed as a sequel to German 109A. Expands on previously introduced materials and features new topics such as the EC, the European Currency System, German company forms and the stock market. Offered in alternate years.

110. Older German Literature in English (4) I. McConnell Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing or consent of instructor. Knowledge of German not required. Analyses in English of German literature from the Middle Ages through the Reformation (*Nibelungenlied*, Gottfried's *Tristan und Isolde* or Wolfram's *Parzival*, lyric poetry, selections from Johann von Tepl, Conrad Celtes, Sebastian Brant, Erasmus, Luther). General Education credit: Civilization and Culture.

111A-H. Major Writers in Translation (4) II. The Staff Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: sophomore standing; course 50, and 52A or 52B or 52C (as appropriate to current segment topic) recommended. Examination of representative works by a major writer, set in the broader cultural context of the relevant period or movement in each case: (A) Goethe; (B) E.T.A. Hoffmann; (C) Thomas Mann; (D) Franz Kafka; (E) Bertolt Brecht; (F) Christa Wolf; (G) Günter Grass; (H) Friedrich Schiller. General Education credit for 111A or 111E: Civilization and Culture.

112A-C. Topics in German Literature (4) I, II, III. The Staff Discussion—3 hours; term paper. Prerequisite: course 50 and 52A or 52B or 52C recommended. Investigation of significant themes and issues within their European context: (A) Women in Literature; (B) Anti-Hero Figures in Literature; (C) Literary Fairytales. Knowledge of German not required. May be repeated in different subject area. General Education credit for 112A, 112B: Civilization and Culture.

113. Goethe's *Faust* (4) II. Bernd, Schaeffer Discussion—3 hours; term paper. Intensive study of one of the great works of world literature: Parts I and II. Discussions and readings in English; reading the text in the original is encouraged. General Education credit: Civilization and Culture.

114. The *Faust* Tradition Before and After Goethe (4) I. The Staff Lecture—3 hours; term paper. Examines predecessors of Goethe's *Faust* (the German chapbook of 1587, Marlowe's *Tragical History of Dr. Faustus* of 1592), and some successors (Mann's novel of 1947) in order to underscore key variations of this provocative and pervasive theme. Knowledge of German not required. Offered in alternate years. General Education credit: Civilization and Culture.

115A. German Literature Since 1945 (4) I. Menges Lecture—3 hours; written reports—1 hour. Knowledge of German not required. Reading of major writers including the post-war generation of Austria, Switzerland and West Germany. Discussion of novelists like Böll, Grass, Johnson, Walsler, Handke; playwrights such as Frisch, Dürrenmatt and Hochhuth, and poets like Celan, Enzensberger, and Aichinger. General Education credit: Civilization and Culture.

115B. German Literature since 1945 (4) II. Kuhn Lecture—3 hours; written reports—1 hour. Knowledge of German not required. Reading and discussion of

the literature of the German Democratic Republic (East Germany), the theory of literature in the socialist world, the practice of this literature as exemplified in such authors as Strittmatter, Seghers, Wolf, Kant, Hacks.

116. From Goethe's *Werther* to Today's Werthers (4) II. The Staff

Lecture—3 hours; discussion—1 hour; written reports. Prerequisite: course 51 or 52B recommended. Comparison of Germany's first international best-seller, Goethe's *The Sufferings of Young Werther* (1774) with its later counterparts, culminating in Plenzdorf's novel of 1973 *The New Sufferings of Young W.* General Education credit: Civilization and Culture.

117A. The Tristan Tradition: Medieval, Musical, Modern (4) III. McConnell

Lecture—3 hours; term paper. Prerequisite: courses 51, 52A, and Music 10 recommended. Three different modes of the Tristan and Isolde legend: the medieval epic poem of Gottfried von Strassburg (1210), the music drama of Wagner (1859) and Thomas Mann's parodistic novella (1903) in their intellectual environment and interrelationship. General Education credit: Civilization and Culture.

117B. The Nibelungen Tradition: Medieval, Musical, and Modern (4) III. McConnell

Lecture—3 hours; term paper. Prerequisite: course 51 or 52A or Music 10 recommended. Knowledge of German not required. Three modes of the Nibelungen legend: the Medieval epic poem *Nibelungenlied*, the Scandinavian *Volsunga Saga*, Wagner's music drama *Ring of the Nibelungen*, and Thomas Mann's *Blood of the Walsungs* in their intellectual environment and interrelationship. General Education credit: Civilization and Culture.

117C. Parzival Tradition: Medieval, Musical, Modern (4) III. McConnell

Lecture—3 hours; term paper. Prerequisite: Music 10 and course 51 recommended. Three modes of the Parzival legend: the medieval epic, Parzival, Wagner's music drama *Parzival* and Thomas Mann's *The Magic Mountain* in their intellectual environment and interrelationship. Knowledge of German not required. General Education credit: Civilization and Culture.

118A. Fin-de-siècle Vienna (The Swan Song of the Habsburg Empire) (4) I. Kuhn

Lecture—1 hour; discussion—2 hours; term paper. Prerequisite: background in European history helpful (e.g., History 147B). Cultural ferment in Vienna, capital of the multinational Habsburg empire, at the turn of the century, with consideration of innovations in literature, music, graphic arts, architecture, philosophy, and psychology, heralding European modernism. Offered in alternate years. General Education credit: Civilization and Culture.

118B. Weimar Culture: Defeat, the Roaring Twenties, the Rise of Nazism (4) II. Kuhn

Lecture—1 hour; discussion—2 hours; term paper. Prerequisite: background in European history helpful (e.g., History 147B). Expressionism in graphic arts, literature, film, New Objectivity, Brecht, and Bauhaus considered in the context of the failure of the German experiment in democracy, the Weimar Republic of 1919-33. Offered in alternate years. General Education credit: Civilization and Culture.

118C. Germany Under the Third Reich (4) I. Kuhn

Lecture—1 hour; discussion—2 hours; term paper. Prerequisite: German 118B and History 147B recommended. Background in European history helpful. Interdisciplinary study of German politics, society, and culture during the Third Reich (1933-45). Historical, literary, psychological, philosophical readings; study of architecture, graphic arts, cinema; fascist aesthetic. Everyday life in Hitler's Germany: consent, dissent, opposition, and resistance; Jews in Germany; the Holocaust. General Education credit: Civilization and Culture.

118E. Contemporary German Culture (4) II. The Staff

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: course 50. Thorough introduction into the political, economic, social and cultural scene of Germany today (Austria and Switzerland marginally

included). Historical background and comparative perspectives. Readings from a variety of sources, films and videotapes. Knowledge of German not required. Offered in alternate years. General Education credit: Civilization and Culture.

119. From German Fiction to German Film (4) II. The Staff

Lecture—3 hours; discussion—1 hour; term paper. Examines a number of film adaptations of major German prose works and plays to ascertain the types of changes involved in the shift in medium and the positive and negative effects achieved by such transfers. General Education credit: Civilization and Culture.

120. Survey of German Culture (4) III. Fetzer

Lecture—3 hours; discussion—1 hour. Prerequisite: course 101. Major developments in such areas of German life as the arts, philosophical thought, social institutions, and political history.

121. The Medieval Period in German Literature (4) I. McConnell

Discussion—3 hours; term paper. Prerequisite: course 101. Literary-philosophical profile of the *Mittelhochdeutsche Blütezeit* in terms of the significant epics, romances, and lyric poetry. Readings in modern German.

122A. Humanism and Reform (4) I. Schaeffer

Lecture/discussion—3 hours; term paper. Prerequisite: course 101. Exemplary literary works of the sixteenth century tracing the principal lines of development and showing the reflection in literature of the social scene.

122B. The Literary Baroque (4) II. Schaeffer

Lecture/discussion—3 hours; term paper. Prerequisite: course 101. Exemplary literary works of the seventeenth century tracing the principal lines of development and showing the reflection in literature of the social scene.

123. Literature of the Classical Age (4) I. Bernd

Discussion—3 hours; term paper. Prerequisite: course 101. A critical assessment of principal works of Goethe and Schiller in their development from *Sturm und Drang* individualism and rebellion to the balanced harmony of the classical period.

124A-D. Major Movements in German Literature (4) I, II, III. The Staff

Discussion—3 hours; term paper. Prerequisite: course 101 or the equivalent. Examination of significant movements and schools, with particular emphasis on the broader cultural dynamics and ideologies as these apply to individual literary works: (A) *Sturm und Drang*; (B) *Romantik*; (C) *Naturalismus*; (D) *Expressionismus*.

125. Short Fiction Around 1900 (4) II. Schaeffer

Lecture—3 hours; term paper. Prerequisite: course 101. Representative short German fiction in the fin-de-siècle period, to attain conversance with various prose styles and the cultural currents they reflect.

126. Modern German Literature (4) I. Menges

Discussion—3 hours; term paper. Prerequisite: course 101. Selections from the significant works of major twentieth-century writers, such as Hesse, Mann, Kafka, Rilke, Brecht, Grass. May be repeated for credit with consent of Undergraduate Major Adviser.

127A-G. Studies in Major Writers (4) III. The Staff

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: course 101 or the equivalent; course 120 and the appropriate segments of course 52A-52B-52C recommended. Examination of representative works by a major writer, set in the broader cultural context of the relevant period or movement in each case: (A) Lessing; (B) Goethe; (C) Kafka; (D) Rilke, George and Hofmannsthal; (E) Brecht; (F) Schiller; (G) Kleist. Course presentation in German. May be repeated for credit when subject area differs.

128A-B. Topics in German Literature (4) I, II, III. The Staff

Discussion—3 hours; term paper. Prerequisite: course 101 or the equivalent. Investigation of significant themes and issues within their European context: (A) *Frauen in der Literatur*; (B) *Der Künstler als literarischer Held und Anti-Held*.

129. Postwar Women Writers (4) III. Finney

Discussion—3 hours; term paper. Prerequisite: course 101. Survey of major women writing in German since 1945. Considers such issues as the existence of "feminine writing" and of a feminist aesthetics. Writers include Seghers, Bachmann, Wolf, Kirsch, Morgner, Wohmann, Stefan, and Schwaiger.

130. Modernity and its Discontents: The Tradition of German Cultural Critique (4) III. The Staff

Lecture—2 hours; discussion—1 hour; four short papers. Prerequisite: History 4B or 4C. Philosophical and aesthetic tradition of *Kulturkritik*, from Nietzsche, Freud, Spengler, Klages, Heidegger, Gehlen, The Frankfurt School. Illustrations from landscape and city representations. Knowledge of German not required. Offered in alternate years. General Education credit: Civilization and Culture.

131. German Lyric Poetry (4) I. The Staff

Lecture—3 hours; term paper. Prerequisite: course 101. Study of the genre of lyric poetry from late Middle Ages through Renaissance, Baroque, Classical, Romantic, and Modern periods in correlation with other literary forms and the social climate of each period.

132. The German *Novelle* (4) I. Bernd

Lecture—3 hours; written reports. Prerequisite: course 101. Inquiry into the art of the "Novelle" through analysis of the materials and formal devices of representative authors from Goethe to Kafka.

133. The German Drama (4) III. Bernd

Lecture—3 hours; term paper. Prerequisite: course 101. Readings in the works of Germany's leading dramatists from the seventeenth century to the present day, such as Lessing, Goethe, Schiller, Kleist, Hebbel, Hauptmann, Brecht.

140. German Political Literature from the Middle Ages to the Present (4) II. McConnell

Lecture—3 hours; discussion—1 hour. Prerequisite: English 3 or 4, or French 25; course 51 recommended. Examination of the relationship of art to politics in German literary history from the time of Walther von der Vogelweide in the Middle Ages, through the Reformation, the period of Romanticism, and the Twentieth Century. General Education credit: Civilization and Culture.

141. The Holocaust and Its Literary Representation (4) I. Menges

Lecture—2 hours; discussion—1 hour; term paper. Knowledge of German not required. Aesthetic representation and metaphorical transformation of the holocaust in its human and historical perspectives. Offered in alternate years. General Education credit: Civilization and Culture.

142C. New German Cinema: From Oberhausen to the Present (4) I. The Staff

Lecture—3 hours; discussion—1 hour. A survey of representative works of the most influential filmmakers of the New German Cinema: Alexander Kluge, Volker Schlöndorff, Rainer Werner Fassbinder, Werner Herzog, Hans-Jürgen Syberberg, Wim Wenders, Margarethe von Trotta, Helke Sander, Helma Sanders-Brahms, and Jutta Brückner.

143. Contemporary German Press (4) I. Schaeffer

Lecture/discussion—3 hours; term paper. Prerequisite: course 101. Study of contemporary German-language newspapers and magazines for insight into political and cultural developments in German-speaking countries. Discussion of contents. Critical approaches. Writing of summaries, rebuttals, comments.

150. Contemporary German Literature (4) I. Kuhn

Discussion—3 hours; term paper. Prerequisite: course 103 or the equivalent. Readings in contemporary literature, including texts by Christa Wolf, Helga Königsdorf, Monika Maron, Günter Grass, Peter Schneider, Günter de Bruyn. Offered in alternate years.

160. Love in the Middle Ages (4) I. McConnell

Lecture—3 hours; discussion—1 hour. Prerequisite: course 101. Analysis of the phenomenon of love in selected medieval lyrical poems and romances of the twelfth and thirteenth century *Blütezeit*. Origins of

courtly love, love and individualism, love and the Church, love and adultery.

165. The German Epigram (4) I. Schaeffer
Lecture/discussion—3 hours; term paper. Prerequisite: course 101. Survey of the German epigram from its beginnings to the present, tracing the origins and development of the genre, its place in European literature, and its function as a mirror of the history of ideas.

166. Die Meistersinger (4) III. Schaeffer
Lecture/discussion—3 hours; listening—1 hour. Prerequisite: course 101. Wagner's music-drama *Die Meistersinger von Nürnberg* against the background of the city's cultural history, the practice of Meistersang and the historical Hans Sachs, to show the relationship of words to music, and the resulting music-drama as an eminently humanistic work. Offered in alternate years.

176. The Kunstmärchen in German Literature (4) III. The Staff

Lecture/discussion—3 hours; term paper. Prerequisite: course 101 and either 110 or 120; Comparative Literature 5 or 168A strongly recommended. Development of the literary "fairy," or magical, tale—beginning with Grimmelshausen and Goethe's epoch-making *Das Märchen*, focusing on Romanticism's poet figure as hero-messiah in the *Erlösungsmärchen* format, and ending with modern variants as in Hoffmannsthal, Kafka, and Brecht.

185. The Age of Bismarck (4) III. Bernd
Discussion—3 hours; term paper. Prerequisite: course 101. Study of notable literary repercussions that took place when Germany's international status reached its peak during the age of the Iron Chancellor. The poetry of Storm, the prose of Fontane, the drama of Hauptmann.

192. Field Work in German (1-12) I, II, III. Henderson
Internship—3-36 hours. Prerequisite: course 109A. Internship with several German companies. Participation in various business activities where expertise in German is expected and further developed. (P/NP grading only.)

194HA-194HB. Honors Program (3-3) I-II. The Staff (Chairperson in charge)

Independent study—2 hours; term paper. Prerequisite: open only to majors with a 3.5 minimum GPA in at least 135 graduation units. (A) Research of an integrative nature (in either "General" or "Area Studies Emphasis" fields of major), guided by thesis advisor chosen by student; (B) Writing of Honors Thesis on topic selected by student in consultation with thesis advisor. (P/NP grading only. Deferred grading only, pending completion of course sequence.)

197T. Tutoring German (2-4) I. Henderson
Lecture—2-4 hours; term paper. Prerequisite: course 102 or consent of instructor. Tutoring and leading of special discussion sections in first-year language classes. Offers teaching opportunities under guidance of staff after initial observation period. Exposes course participants to all phases of language teaching; instant feedback and discussion. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200A. German Colloquium Series (2) I. The Staff
Lecture/discussion—2 hours. A literary colloquium designed to help students prepare for the M.A. Examination. Review of texts based on the M.A. Reading List (Middle Ages to 1790), including pertinent bibliographies and other research tools. Required of M.A. candidates. (S/U grading only.)

200B. German Colloquium Series (2) II. The Staff
Lecture/discussion—2 hours. A literary colloquium designed to help students prepare for the M.A. Examination. Review of texts based on the M.A. Reading List (1790-1900), including pertinent bibliographies and other research tools. Required of M.A. candidates. (S/U grading only.)

200C. German Colloquium Series (2) III. The Staff
Lecture/discussion—2 hours. A literary colloquium designed to help students prepare for the M.A. Examination. Review of texts based on the M.A. Reading List (1900 to present), including pertinent bibliographies and other research tools. Required of M.A. candidates. (S/U grading only.)

***202. Middle High German** (4) II. McConnell
Discussion—3 hours; lecture—1 hour. Outline of grammar; selections from Middle High German epic, romance, and lyric poetry.

***210. Techniques of Literary Scholarship** (4) I. The Staff
Seminar—3 hours; term paper. The bibliographical, organizational, and methodological tools and resources for advanced, independent research.

211. Concepts in Literary Theory (4) II. Menges
Seminar—3 hours; written reports. Advanced course in concepts of literary theory and criticism. Discussion of the emergence of theoretical concepts and their impact on the understanding and appreciation of literary works. Discussion in German and English, readings in German.

212. Contemporary Approaches to Literary Theory (4) III. Finney
Seminar—3 hours; term paper. Study of contemporary theoretical approaches such as structuralism, deconstruction, feminism, Marxism/Frankfurt School, and reception theory in conjunction with the works of major authors.

239. Narrative and Narrative Theory (4) I. Finney
Seminar—3 hours; term paper. Studies, in a theoretical and literary historical context, major elements of 19th- and 20th-century narrative, such as techniques of framing, refraction, and montage; narrative perspective; mimesis; and self-consciousness. Focuses on paradigmatic prose texts alongside a spectrum of critical approaches. Offered in alternate years.

240. Forms of German Verse (4) II. Bernd
Seminar—3 hours; term paper. The development of German verse from the Middle Ages to the present, with special emphasis on different techniques of text analysis and interpretation. May be repeated for credit with consent of instructor. Offered in alternate years.

241. The German Drama (4) I. Finney
Seminar—3 hours; term paper. The major forms of German drama from its origins to the middle of the twentieth century. May be repeated for credit with consent of instructor.

242. The German Novelle (4) II. Bernd
Seminar—3 hours; term paper. The major German *Novellisten*, with particular emphasis on the flowering of this genre in the nineteenth century. May be repeated for credit with consent of instructor.

243. Fontane and the Rise of the Modern German Novel (4) II. Bernd
Seminar—3 hours; term paper. Fontane, the father of the modern German novel and the chief German representative of the European novel at its greatest, in the context of the nineteenth-century European political and social scene.

244. Gender and Comedy (4) III. Finney
Seminar—3 hours; term paper. Studies of genre and gender in German-language comedy by male and female writers from the 18th century to the present. Authors treated include Lessing, Kleist, Büchner, Ebner-Eschenbach, Hauptmann, Hofmannsthal, Frisch, Langer, and Jelinek. Offered in alternate years.

252. The Writings of Lessing (4) I. The Staff
Seminar—3 hours; term paper. Study of Lessing's theory of literature with particular emphasis upon his critical attacks on French drama.

253. Goethe (4) II. The Staff
Seminar—3 hours; term paper. Study of the origins of Goethe's thought in German Pietism, and his principal artistic, autobiographical, scientific, and philosophical works.

254. Schiller (4) III. The Staff
Seminar—3 hours; term paper. A critical analysis of Schiller's major works and his impact on the intellectual climate in Germany during the late eighteenth and early nineteenth centuries.

255. Aesthetics in the Age of Goethe (4) I. Menges
Seminar—3 hours; term paper. Prerequisite: German 200A, 200B, 200C. Focuses on the emergence of aesthetic autonomy from eighteenth century normative poetics during the Age of Goethe. This involves the shift from a model based on the imitation of nature (and the Ancients) to a new concept grounded in the individuality of aesthetic experience.

257. Heinrich von Kleist (4) III. Bernd
Seminar—3 hours; term paper. Kleist's important dramatic and prose works; special attention will be given to the peculiar hermeneutic problems in modern German, French, and Anglo-American Kleist criticism.

258. The Novels of Thomas Mann (4) II. Menges
Seminar—3 hours; term paper. Reading of selected novels with emphasis on aesthetic techniques, originality, ethical and political views, and influence on the contemporary literary scene in Germany.

259. Studies in Kafka (4) II. The Staff
Seminar—3 hours; term paper. Study of Kafka's narrative techniques with special emphasis in the shorter works on the existential development from its roots in expressionism.

260. The Poetry of Rilke (4) I. Menges
Seminar—3 hours; term paper. Study of the principal motifs, myths, images, and problems in the poetry of Rainer Maria Rilke.

261. Brecht and the Epic Theater (4) III. Menges
Seminar—3 hours; term paper. A reading of Brecht's works with emphasis on the ideas which impelled the development of new literary forms and concepts.

262. Studies in Turn-of-the-Century Culture (4) II. Finney

Seminar—3 hours; term paper. Investigates literary currents in turn-of-the-century Germany and Austria against the background of contemporaneous developments in psychology, the visual arts, philosophy, and music. Authors treated include Hauptmann, Holz and Schlaf, Schnitzler, T. Mann, Wedekind, Musil, Hofmannsthal. Offered in alternate years.

270A. Research in a Period or Topic (4) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour; term paper. Individually guided research, under the supervision of a faculty member, in the specialized study of a period or problem that holds promise of yielding dissertation topics, culminating in a term paper. Recommended for Ph.D. candidates prior to the Qualifying Examination.

270B. Basic Research for the Dissertation (4) I, II, III. The Staff (Chairperson in charge)

Individual instruction from a faculty member—1 hour. Prerequisite: course 270A. Individually guided intensive research, under the supervision of a faculty member, designed to develop expertise and generate basic materials (such as a detailed outline and bibliography) for the dissertation topic. Required for Ph.D. candidates prior to the Qualifying Examination.

270C. Basic Research for the Dissertation (4) I, II, III. The Staff (Chairperson in charge)

Individual instruction from a faculty member—1 hour. Prerequisite: course 270B. Individually guided intensive research, under the supervision of a faculty member, designed to develop expertise and generate basic materials (such as a detailed outline and bibliography) for the dissertation topic. Required for Ph.D. candidates prior to the Qualifying Examination.

285. Middle High German Literature (4) III. McConnell
Seminar—3 hours; term paper. Prerequisite: course 202 or consent of instructor. Extensive reading of Middle High German texts in the original language. Examines linguistic and literary problems. May be repeated for credit with change of subject matter and consent of instructor.

288. The Renaissance and Reformation in German Literature (4) I. Schaeffer
Seminar—3 hours; term paper. The parabolic and didactic style in Germany's literature during the sixteenth century. May be repeated for credit with consent of instructor.

289. German Literature of the Baroque (4) I. Schaeffer
Seminar—3 hours; term paper. The "Elegantiideal"

and the varying methods used to portray it in seven-teenth-century German literature. May be repeated for credit with consent of instructor.

290. The Enlightenment in German Literature (4) I. The Staff

Seminar—3 hours; term paper. Revolt against the concept of the "Elegantiadeal," and evolution of a new literature based on reason and wit. May be repeated for credit with consent of instructor.

292. Sentimentality and "Sturm und Drang" in German Literature (4) III. Menges

Seminar—3 hours; written reports. Reaction to overemphasis on Reason: theories of Hamann and Herder and works of poets such as Lenz, Leisewitz, the early Goethe and Schiller. May be repeated for credit with consent of instructor.

293. The Classical Age of German Literature (4) I. Bernd

Seminar—3 hours; term paper. Inquiry into the aesthetic and humanistic qualities of Germany's greatest literary epoch. May be repeated for credit with consent of instructor.

294. The Romantic Period in German Literature (4) III. Menges

Seminar—3 hours; term paper. Survey of the works of early nineteenth-century authors in reaction against the age of classicism. May be repeated for credit with consent of instructor.

295. Poetic Realism in German Literature (4) I. Bernd

Seminar—3 hours; term paper. Outstanding figures in German literature between 1840 and 1890. Important phases in their developments will be treated. May be repeated for credit with consent of instructor.

296. Twentieth-Century German Literature (4) I. Kuhn

Seminar—3 hours; term paper. Considers the revolt of the Hauptmann generation, symbolism, expressionism, and the chief currents of the contemporary scene. May be repeated for credit with consent of instructor.

297. Special Topics in German Literature (4) I, II, III. The Staff

Seminar—3 hours; term paper. Various special topics in German literature, which may cut across the more usual period and genre rubrics. May be repeated for credit when topic differs.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299D. Special Study for the Doctoral Dissertation (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299T. Special Study for the Master's Thesis (6) III. The Staff

Independent study—5 hours; term paper/discussion—1 hour. Prerequisite: acceptance into M.A. Plan I Thesis Option. Intensive research and tutorial guidance for candidates accepted into Plan I of the Master's program, culminating in a complete draft of the Thesis text (min. 50 pp.) scheduled for final submittal between June and September of the same year. (S/U grading only.)

Professional Courses

390A. The Teaching of German (2) I. Henderson
Lecture—2 hours. Prerequisite: graduate standing or consent of instructor. Theoretical instruction in modern teaching methods and demonstration of their practical application. Required of new teaching assistants. (S/U grading only.)

390B. The Teaching of German (2) II. Henderson
Lecture—2 hours. Prerequisite: graduate standing or consent of instructor. Theoretical instruction in modern teaching methods and demonstration of their practical application. Required of new teaching assistants. (S/U grading only.)

390C. The Teaching of German (2) III. Henderson
Lecture—2 hours. Prerequisite: graduate standing or consent of instructor. Theoretical instruction in mod-

ern teaching methods and demonstration of their practical application. Required of new teaching assistants. (S/U grading only.)

391. Teaching Practicum and Coaching Conference (1) I, II, III. Henderson

Conference—1 hour. Prerequisite: appointment as Teaching Assistant; course 390A, 390B, 390C. Ongoing consultation with Language Teaching Supervisor concerning application of technique and innovations within Teaching Assistant's classroom responsibility. Required of all Teaching Assistants after first year of appointment. May be repeated for credit. (S/U grading only.)

Professional Course

400. Tutorial and Instructional Internship (1-3) I, II, III. The Staff (Chairperson in charge)

Discussion—1-3 hours. Prerequisite: graduate standing. Apprentice training in ongoing undergraduate literature courses taught by regular staff, with supplementary weekly critique sessions; intern leadership of discussion sections under staff supervision. May be repeated for credit.

Greek

See Classics

Hebrew

See Religious Studies

History

(College of Letters and Science)

Barbara Metcalf, Ph.D., Chairperson of the Department

Department Office, 176 Voorhies Hall (916-752-0776)

Faculty

Arnold J. Bauer, Ph.D., Professor
Cynthia L. Brantley, Ph.D., Associate Professor
Beverly Bossler, Ph.D., Assistant Professor
Daniel R. Brower, Jr., Ph.D., Professor
Betty Jo Teeter Dobbs, Ph.D., Professor
Paula E. Findlen, Ph.D., Assistant Professor
William W. Hagen, Ph.D., Professor
Karen Halttunen, Ph.D., Professor
Phyllis G. Jestice, Ph.D., Assistant Professor
Catherine J. Kudlick, Ph.D., Assistant Professor
Norma B. Landau, Ph.D., Professor
Susan L. Mann, Ph.D., Professor
Roland Marchand, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*
Ted W. Margadant, Ph.D., Professor
Barbara Metcalf, Ph.D., Professor
Don C. Price, Ph.D., Professor
Ruth E. Rosen, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*
Michael Saler, Ph.D., Assistant Professor
Michael Smith, Ph.D., Associate Professor, *Academic Senate Distinguished Teaching Award*
Kathleen Stuart, Ph.D., Assistant Professor
Charles Walker, Ph.D., Assistant Professor
Clarence E. Walker, Ph.D., Professor

Emeriti Faculty

William M. Bowsky, Ph.D., Professor Emeritus
David Brody, Ph.D., Professor Emeritus

Daniel H. Calhoun, Ph.D., Professor Emeritus
Robert O. Crummey, Ph.D., Professor Emeritus
Manfred P. Fleischer, Ph.D., Professor Emeritus
Paul Goodman, Ph.D., Professor Emeritus
W. Turrentine Jackson, Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award*

David L. Jacobson, Ph.D., Professor Emeritus
Kwang-Ching Liu, Ph.D., Professor Emeritus
Rollie E. Poppino, Ph.D., Professor Emeritus
Morton Rothstein, Ph.D., Professor Emeritus
Richard N. Schwab, Ph.D., Professor Emeritus
Morgan B. Sherwood, Ph.D., Professor Emeritus
James H. Shideler, Ph.D., Professor Emeritus
Wilson Smith, Ph.D., Professor Emeritus
Stylianios Spyridakis, Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award*
F. Roy Willis, Ph.D., Professor Emeritus, *UC Davis Prize for Teaching and Scholarly Achievement*

The Major Program

The history major is designed to develop critical intelligence and to foster an understanding of ourselves and our world through the study of the past—both remote and recent.

The Program. A student electing a major in History may complete Plan I or Plan II. *Plan I* enables students to receive a broad education in the history of one geographic area or time period of their choosing. The purpose of *Plan II* is to encourage interested students, including those preparing for graduate work in history, to enroll in a seminar, to undertake independent work, and to study the history of history as part of the major. Students preferring more active engagement in research and writing are encouraged to follow Plan II.

Career Alternatives. A degree in history is excellent preparation for a professional career such as teaching, law, journalism, public administration, or business management. Professional schools in these and related fields are looking for students who can weigh conflicting evidence, evaluate alternative courses of action or divergent points of view, and express conclusions logically in everyday language. These analytical skills are stressed in many history classes, and their mastery gives the history student a solid preparation for subsequent training in a specialized career.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	20
(Plan I or II)	

Five lower division courses, including at least two from each of two of the following fields.....20

- Western Civilization: History 4A, 4B, 4C, 3, 10, 30
- Asian Civilization: History 8, 9A, 9B
- United States and Latin America: History 17A, 17B, 17C, 72A, 72B, 85, 86
- Africa: History 15

Depth Subject Matter—Plan I.....40-41

At least six upper division courses from one of the fields of concentration† listed below. Include a two-quarter sequence of courses.....24

At least three upper division courses from one of the other fields listed.....12

At least one course from the following: History 101, or 102 (in field of concentration; in exceptional circumstances, a student may with the permission of an adviser, take the seminar in another field), or 103 (in field of concentration).....4-5

Total Units for the Major, Plan I.....60-61

Depth Subject Matter—Plan II.....42

At least four upper division courses from one of the fields of concentration† listed below. Include a two-quarter sequence of courses.....16

At least three upper division courses from one of the other fields listed.....12
History 101.....5

*Course not offered this academic year.

History 102 in field of concentration (in exceptional circumstances, a student may with the permission of an adviser, take the seminar in another field), or 103 (in field of concentration).....5

History 103 in field of concentration.....4

Total Units for the Major, Plan II62

† Fields of Concentration

- a. *European History*: History 102A, 102B, 102C, 102D, 102E, 102F, 102I, 102P, 111A, 111B, 111C, 121A, 121B, 121C, 122, 130A, 130B, 130C, 131A, 131B, 131C, 132, 133, 134A, 134B, 137A, 137B, 137C, 138, 141, 142, 143, 144, 145, 146A, 146B, 147A, 147B, 147C, 148A, 148B, 149, 151A, 151B, 151C, 151D.
- b. *United States History*: History 102K, 102L, 102M, 169A, 169B, 170A, 170B, 170C, 171A, 171B, 174A, 174B, 174C, 174D, 175A, 175B, 175C, 176A, 176B, 177A, 177B, 179, 180A, 180B, 180C, 181, 183A, 183B, 185A, 185B, 187A, 187B, 188A, 188B, 189A, 189B, 189C.
- c. *Asian History*: History 102G, 102H, 102N, 102Q, 102R, 110, 190A, 190B, 190C, 191A, 191B, 193, 194A, 194B, 194C, 194D, 195, 196A, 196B.
- d. *African History*: History 102O, 110, 115A, 115B, 115C, 116.
- e. *Latin American History*: History 102J, 110, 161A, 161B, 162, 163A, 163B, 165, 166A, 166B, 168, 169A, 169B.
- f. A student may group courses from two related fields, (a) through (e) above, to make a field of concentration when there are not enough courses in one particular area of study. Approved groupings include: Africa and Europe, Africa and Latin America, Africa and the United States. For other groupings, or to meet special needs, a student should obtain written approval from an adviser. Within broad fields, a student may wish to concentrate some of the courses on a particular area or period, such as China or Great Britain or Medieval Europe. Special approval is not required.

History and Philosophy of Science

The following courses from the History and Philosophy of Science program count toward the History major and fulfill upper division requirements in the European field: History and Philosophy of Science 120, 130A. The following courses fulfill upper division requirements in either the U.S. or European field: History and Philosophy of Science 130B, 150, 180.

Students can create a major field in the History of Science upon consultation with a faculty adviser. They may draw upon the relevant History courses (History 85, 86, 135A, 135B, 185A, and 185B) as well as History and Philosophy of Science offerings to do so.

Consult the History and Philosophy of Science program for a more detailed description of course offerings this area and the minor in History and Philosophy of Science.

Major Advisers. C.L. Brantley, D.R. Brower, P.F. Findlen, P.G. Jestic, C.J. Kudlick, N.B. Landau, T.W. Margadant, B. Metcalf, D.C. Price, R.E. Rosen, M. Smith, S. Spyridakis.

Minor Program Requirements:

History units may be taken in a single field of concentration, such as Africa, East Asia, Europe, Latin America or the United States. Alternatively, students may select a minor with a thematic emphasis, as listed below, or design a thematic minor in consultation with a Department adviser.

UNITS

History20

At least 20 units of upper division history courses.....20

Examples of minor with thematic emphasis:

Pre-Law (British and American Political and Constitutional Development); The Twentieth Century; The History of Ideas in Society.

Minor Advisers. Same as for major advisers.

Honors and Honors Program. A student becomes eligible for graduation with honors by meeting the minimum grade-point average and course requirements established by the College of Letters and Science. To qualify for high or highest honors, students must also complete the History Department honors program with a grade-point average of 3.5 or above in honors courses. Students will be invited to participate in the department honors program during the latter part of their junior year on the basis of grade-point average, interviews, and faculty recommendations. They are required to complete the History 104A, 104B, 104C sequence of honors courses, which includes the completion of a senior honors thesis. Students who anticipate seeking admission to the honors program are urged to complete at least one History 102 (undergraduate seminar) before the end of their junior year. They may follow any of the three plans for depth subject matter described above, and may substitute History 104 in their program (though they may not substitute it for History 102).

Students who anticipate pursuing graduate work in history or a teaching credential, and who do not wish to opt for the research emphasis embodied in the honors program, are encouraged to select Plan II of the major.

Teaching Credential Subject Representative. See also the section on the Teacher Education Program.

Waiver Program for Single-Subject Teaching Credential in History. The Department of History offers a program of study for students seeking a secondary teaching credential in history. The program can be accommodated within the requirements for the major in History, but does require some specific course work. A list of current course requirements is available in the Advising Office, Division of Education, 174 Kerr Hall.

Graduate Study. The Department of History offers programs of study and research leading to the M.A. and Ph.D. degrees in history. Detailed information may be obtained by writing to the Graduate Adviser, Department of History.

Graduate Advisers. A.J. Bauer, T.W. Margadant.

American History and Institutions. This University requirement can be satisfied by passing any one of the following courses in History: 17A, 17B, 72A, 72B, 170A, 170B, 170C, 171A, 171B, 174A, 174B, 174C, 175A, 175B, 175C, 176A, 176B, 177A, 177B, 180A, 180B, 183A, 183B. The upper division courses may be used only with the consent of the instructor. (See also under University requirements.)

Courses in History (HIS)

Lower Division Courses

3. Cities: A Survey of Western Civilization (4) II.

The Staff

Lecture—3 hours; discussion—1 hour. Survey of western civilization, focusing on nine cities, at the period of their greatest creativity: Athens, Rome, Constantinople, Paris, Florence, Amsterdam, London, Berlin, Moscow. Illustrated with slides, music, and optional films. General Education credit: Civilization and Culture.

4A. History of Western Civilization (4) I.

Lecture—3 hours; discussion—1 hour. Growth of western civilization from late antiquity to the Renaissance. General Education credit: Civilization and Culture.

4B. History of Western Civilization (4) II, III. The Staff

Lecture—3 hours; discussion—1 hour. Development of western civilization from the Renaissance to the Eighteenth Century. General Education credit: Civilization and Culture.

4C. History of Western Civilization (4) I, II, III. The Staff

Lecture—3 hours; discussion—1 hour. Development of Western Civilization from the Eighteenth Century to the present. General Education credit: Civilization and Culture.

8. History of Indian Civilization (4) III. Metcalf

Lecture—3 hours; discussion—1 hour; written reports. Survey of Indian civilization from the rise of cities (ca. 2000 B.C.) to the present, emphasizing themes in religion, social and political organization, and art and literature that reflect cultural interaction and change. General Education credit: Civilization and Culture.

9A. History of East Asian Civilization (4) I, III. The Staff

Lecture—3 hours; discussion—1 hour. Surveys traditional Chinese civilization and its modern transformation. Emphasis is on thought and religion, political and social life, art and literature. Perspectives on contemporary China are provided. General Education credit: Civilization and Culture.

9B. History of East Asian Civilization (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Surveys traditional Japanese civilization and its modern transformation. Emphasis is on thought and religion, political and social life, art and literature. Perspectives on contemporary Japan are provided.

*10. World History of the Twentieth Century (4)

Lecture—3 hours; discussion—1 hour. History of the world in the twentieth century, emphasizing major powers and their leaders (Wilson, Lenin, Hitler, Roosevelt, Stalin, Mao, Nehru, Nasser, Castro). General Education credit: Contemporary Societies.

15. Introduction to African History (4) II. Brantley

Lecture—3 hours; discussion—1 hour. Examination of the long-range historical context as background to current conditions in Africa. Includes the early development of African civilizations, the slave trade and its abolition, 20th century colonization, and African independent states.

17A. History of the United States (4) I. Haltunen

Lecture—3 hours; discussion—1 hour. Growth of the American people from Colonial times to 1815. General Education credit: Civilization and Culture.

17B. History of the United States (4) II, III. Walker
Lecture—3 hours; discussion—1 hour. Growth of the American people from 1815 to 1915. General Education credit: Civilization and Culture.

*17C. History of the United States (4) Marchand

Lecture—3 hours; discussion—1 hour. Growth of the American people from 1915 to the present.

*25. Thematic History Seminar (4) II. The Staff

Seminar—3 hours; term paper. Prerequisite: freshman or sophomore standing. Explores in-depth a historical topic related to the research interests of the instructor. Addresses historical questions, controversies, methodology, and interpretations.

*30. Russian Cultural History (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Survey of Russia's history over the last thousand years as reflected in the lives of her political leaders, artists, and rebels. Lectures will use the biographies of Russian political leaders, intellectuals and artists to illustrate the general currents of the country's political, social, and cultural development. General Education credit: Civilization and Culture.

72A. Social History of American Women and the Family (4) I. Rosen

Lecture—3 hours; discussion—1 hour. Social and cultural history of women, sex roles and the family from colonial America until the late nineteenth century emphasizing changes resulting from the secularization, commercialization, and industrialization of American society. General Education credit: Civilization and Culture.

72B. Social History of American Women and the Family (4) III. Rosen

Lecture—3 hours; discussion—1 hour. Social and cultural history of women, sex roles, and the family in twentieth-century America, emphasizing female reformers and revolutionaries, working class women,

consumerism, the role of media, the "feminine mystique," changes in family life, and the emergent women's movement. General Education credit: Civilization and Culture or Contemporary Societies.

***85. Nature, Man, and the Machine in America (4)** Seminar—4 hours; term paper. Prerequisite: consent of instructor. History of the attitudes and behavior of Americans toward their natural environment and their technology, from colonial times to the present. No final examination. Limited enrollment.

***86. Quackery and Pseudoscience in America (4)** Lecture—3 hours; tutorial supervision of research paper. History of humbug and pseudoscience in America: witchcraft, medical quackery, spiritualism, science hoaxes, technological frauds, literary and artistic forgeries, UFOs, pyramidology, astrology, psychic phenomena. Emphasis upon explanations for the existence of deception and pseudoscience.

***88. Directed Group Study (1-5)** The Staff (Chairperson in charge) Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

***89. Special Study for Undergraduates (1-5)** The Staff (Chairperson in charge) (P/NP grading only.)

Upper Division Courses

101. Introduction to Historical Thought and Writing (5) II, III. The Staff

Lecture/discussion—4 hours; term paper. Prerequisite: consent of instructor. Study of the history of historical thought and writing, analysis of critical and speculative philosophies of history and evaluation of modes of organization, interpretation, and style in historical writing.

102A-R, X. Undergraduate Proseminar in History (5) I, II, III. The Staff

Seminar—3 hours; term paper. Designed primarily for history majors. Intensive reading, discussion, research, and writing in selected topics in the various fields of history. (A) Ancient; (B) Medieval; (C) Renaissance and Reformation; (D) Modern Europe to 1815; (E) Europe since 1815; (F) Russia; (G) China to 1800; (H) China since 1800; (I) Britain; (J) Latin America since 1810; (K) American History to 1787; (L) United States, 1787-1896; (M) United States since 1896; (N) Japan; (O) Africa; (P) Christianity and Culture in Europe, 50-1850; (Q) India; (R) Muslim Societies; (X) Comparative History, selected topics in cultural, political, economic, and social history that deal comparatively with more than one geographic field. May be repeated for credit. Limited enrollment.

***103. Topics in Historical Research (4)** The Staff (Chairperson in charge)

Discussion—3 hours; individual consultation with instructor; term paper. Prerequisite: consent of instructor. Individual research resulting in a research paper on a specific topic in one of various fields of history. May be repeated for credit.

104A. Introduction to Historical Research and Interpretation (4) I. The Staff

Seminar—3 hours; term paper. Prerequisite: acceptance into History Department Honors Program. Directed reading and research aimed at preparing students to select appropriate topics and methodologies for a senior honors essay and to situate their topics within a meaningful, broad context of historical interpretations. Culminates in the submission of a full prospectus for an honors essay.

***104B. Honors Tutorial (4)** The Staff
Tutorial—4 hours. Prerequisite: course 104A. Research in preparation of a senior honors thesis under the direction of a faculty adviser. (Deferred grading only, pending completion of sequence.)

***104C. Honors Tutorial (4)** The Staff
Tutorial—4 hours. Prerequisite: course 104A and 104B. Completion of a senior honors thesis under the direction of a faculty adviser.

***110. Themes in World History (4)**
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing; at least 8 units in history. Issues in world history from 1400 to the present. Top-

ics will emphasize the interaction of diverse regions of the world as well as common patterns of historical change. Offered in alternate years.

***111A. Ancient History (4)** Spyridakis
Lecture—3 hours; discussion or paper (student option). History of ancient empires of the Near East and of their historical legacy to the Western world.

111B. Ancient History (4) I. Spyridakis
Lecture—3 hours; discussion or paper (student option). Political, cultural and intellectual study of the Greek world from Minoan-Mycenaean period to end of Hellenistic Age.

***111C. Ancient History (4)** Spyridakis
Lecture—3 hours; discussion or paper (student option). Development of Rome from earliest times. Rise and fall of the Roman Republic; the Empire to 476 A.D.

***115A. History of West Africa (4)** Brantley
Lecture—3 hours; written reports. Prerequisite: courses 4A, 4B, 4C recommended. Introductory survey of the history of West Africa and the Congo region from the earliest times to the present.

115B. History of East and Central Africa (4) II. Brantley
Lecture—3 hours; written reports. Prerequisite: course 115A recommended. Introductory survey of the history of east and central Africa from 1000 to the present. This course is a part of an interdisciplinary East African sequence which includes History 115B (winter) and Political Science 138.

115C. History of Southern Africa, Swaziland, Lesotho, and Botswana from 1500 to the Present (4) III. Brantley

Lecture—3 hours; written reports. Prerequisite: courses 115A and 115B recommended. Introductory survey of the history of Southern Africa, including South Africa, Swaziland, Lesotho, and Botswana from 1500 to the present.

***116. African History: Special Themes (4)** The Staff
Lecture—3 hours; term paper. Prerequisite: courses 115A and 115B recommended. Themes of African history, such as African states and empires, slave trade, relationship of Egypt to rest of Africa, Bantu origins and migrations, and French policy of Assimilation and Association.

***121A. Medieval History (4)** The Staff
Lecture/discussion and panel presentations—3 hours. European history from "the fall of the Roman Empire" to the eighth century.

***121B. Medieval History (4)** The Staff
Lecture/discussion and panel presentations—3 hours. European history from Charlemagne to the twelfth century.

***121C. Medieval History (4)** The Staff
Lecture/discussion and panel presentations—3 hours. European history from the Crusades to the Renaissance.

***122. Selected Themes in Medieval History (4)** The Staff
Lecture—3 hours; term paper. Each offering will focus on single major theme, such as medieval agrarian history, feudalism, the family, medieval Italy, or the Crusades. Readings include original sources in English translation and modern works. May be repeated for credit.

125. Topics in Early Modern European History (4) III. Stuart

Laboratory/discussion—3 hours; term paper. Prerequisite: course 4B recommended. Social and cultural history, 1300-1800. Topics such as medieval and Renaissance Italy, early modern Italy, Ancien Regime France, family and sexuality, and material culture and daily life. May be repeated for credit.

***130A. Christianity and Culture in Europe: 50-1450 (4)**

Lecture—3 hours; written report or research paper. A history of the ideas and institutions of Christianity and their impact on the late Roman Empire and medieval Europe in terms of outlook on life, art, politics and economics.

***130B. Christianity and Culture in Europe: 1450-1600 (4)** II. The Staff

Lecture—3 hours; written report or research paper. A history of the Lutheran, Zwinglian-Calvinist, Radical, Anglican, and Catholic Reformations as foundation stones of a new culture in Europe, with special attention to the interconnections between the revival of antiquity and the different reform movements.

***130C. Christianity and Culture in Europe: 1600-1850 (4)** The Staff

Lecture—3 hours; written report or research paper. A survey of the intellectual, cultural and political reorientation of European society in the aftermath of the Wars of Religion. "Secularization" will be discussed in the context of the Enlightenment and Romanticism.

***131A. Early Modern European History (4)** Stuart
Lecture—3 hours; written reports. Prerequisite: courses 4A, 4B recommended. Western European history from about 1350 to about 1500.

131B. Early Modern European History (4) II. Stuart
Lecture—3 hours; written reports. Prerequisite: courses 4A, 4B, 131A recommended. Western European history from about 1500 to about 1650.

131C. Early Modern European History (4) III. Stuart
Lecture—3 hours; written reports. Prerequisite: courses 4A, 4B, 131B recommended. Western European history from about 1650 to about 1789.

***133. The Age of Ideas (4)** The Staff
Lecture—3 hours; written reports. The Enlightenment and its background in the seventeenth century.

***134A. The Age of Revolution (4)** I. The Staff
Lecture—3 hours; written reports. Ideas and institutions during the French Revolution and the Napoleonic era.

135A. History of Science to the 18th Century (4) I. Dobbs

Lecture/discussion—3 hours; term paper. Prerequisite: upper division standing. Survey of the historical development of science, technology, and medicine from the ancient world to the eighteenth century, with special emphasis on Isaac Newton as the culmination of the seventeenth century scientific revolution.

135B. History of Science, 18th to 20th Centuries (4) II. Dobbs

Lecture/discussion—3 hours; term paper. Prerequisite: upper division standing. Survey of the historical development of scientific thought in geology, biology, chemistry, physics, and cosmology from the eighteenth to the twentieth century, with special emphasis on emergence of broad explanatory principles that serve more than one science.

***136. Scientific Revolution (4)** II. Findlen
Lecture/discussion—3 hours; term paper. Prerequisite: course 135A or 135B recommended. History of science in Western Europe (1400-1750). Investigates the changing definitions of science in the age of Copernicus, Vesalius, Harvey, Galileo and Newton. Considers the evolution of new ideas about nature, experiment, observation, and scientific theory.

***137A. Russian History: Kievan, Muscovite, and Petrine (4)** I. Brower

Lecture—3 hours; term paper. Russian civilization from early times to 1725. Emphasis on the rise of autocracy and the evolution of society and culture.

137B. Russian History: The Empire, 1725-1900 (4) II. Brower

Lecture—3 hours; term paper. Russian civilization from the Petrine reforms to the end of the nineteenth century. Emphasis on the strengthening and reform of the autocracy, the rise of movements for revolutionary change, and the evolution of society and culture.

***137C. Revolutionary and Soviet Russia, 1900 to the Present (4)** III. Brower

Lecture—3 hours; written reports. Evolution of the Russian state and society from the collapse of tsarist Russia through the creation and consolidation of the new Soviet order.

138. History of the Russian Revolution (4) II. Brauer

Lecture—3 hours; term paper and oral reports. History of the fall of the Russian autocracy and of the Revolu-

tion of 1917. Offered in alternate years. General Education credit: Civilization and Culture.

***139A. Medieval and Renaissance Medicine** (4) Laboratory/discussion—3 hours; term paper. The history of medicine, circa 1000-1700. Revival of ancient medicine; role of the universities; development of anatomy, chemistry and natural history; ideas about the body; cultural understanding of disease; hospital and the public health system. Offered in alternate years. General Education credit: Civilization and Culture.

139B. Medicine, Society, and Culture in Modern Europe (4) III. Kudlick
Lecture—2 hours; discussion—1 hour; term paper. History of European medicine, 18th to 20th centuries, by examining the development of medical knowledge in epidemiology and anatomy; function of this knowledge, how it changed with technological breakthroughs and professionalization; and role of medicine in attitudes toward poverty, women, race, disease. Offered in alternate years.

***140. The Rise of Capitalism in Europe** (4) III. Hagen
Lecture—3 hours; term paper. Prerequisite: course 4B or 4C. Comparative analysis of major interpretations of the rise of merchant capitalism during the Middle Ages and Renaissance; European expansion overseas, 1450-1815; the transition to modern capitalism via industrial revolution. Interplay of social, political, cultural, and economic history. Offered in alternate years. General Education credit: Civilization and Culture.

141. France Since 1815 (4) II. Margadant
Lecture—3 hours; term paper.

***142. Why the Holocaust?** (4) II. The Staff
Lecture—3 hours; term paper. Long- and short-term causes of the Holocaust; the emancipation of European Jewry; the rise of modern antisemitism; nationality question in central Europe; antisemitism and German politics; Nazism and mass murder; responses by victims and bystanders.

143. History of Eastern Europe and the Balkans (4) III. The Staff
Lecture—3 hours; essays. History of the Baltic, Danubian, and Balkan lands since the Middle Ages. National cultures and conflicts in the Polish Commonwealth and the Habsburg and Ottoman Empires; nationalist movements, 1789-1914; the twentieth century, including an analysis of the contemporary scene.

144. History of Germany since 1648 (4) II. Hagen
Lecture—3 hours; essays. Social and political history of Germany in the ages of absolutism and the Enlightenment, industrialization and national unification, the World Wars, and since 1945.

***145. War and Revolution in Europe, 1789-1918** (4) Margadant
Lecture—3 hours; term paper. Survey of revolutionary movements, international crises, and wars in Europe from the French Revolution to World War I.

146A. Europe in the Twentieth Century (4) I. Willis
Lecture—3 hours; term paper. Survey of the history of Europe from 1919 to 1939.

146B. Europe in the Twentieth Century (4) II. Willis
Lecture—3 hours; term paper. Survey of the history of Europe since 1939.

147A. European Intellectual History, 1800-1870 (4) I. Saler
Lecture—3 hours; term paper. European thought in the early industrial era. Shifting cultural frameworks, from romanticism to scientism; liberal and socialist reactions to social change. Focus on the work of Goethe, Hegel, J.S. Mill, Marx, Darwin and Flaubert. General Education credit: Civilization and Culture.

***147B. European Intellectual History, 1870-1920** (4) II. Saler
Lecture—3 hours; term paper. Cultural and intellectual watershed of the late nineteenth and early twentieth centuries. Emergence of modern art and literature; psychoanalysis and the new social sciences. Focus on the work of Baudelaire, Wagner, Nietzsche, Freud, Weber and Kafka. General Education credit: Civilization and Culture.

147C. European Intellectual History, 1920-1970 (4) III. Saler

Lecture—3 hours; term paper. European thought and culture since World War I. Coverage includes: literature and politics; Communism and Western Marxism; Fascism; Existentialism; Structuralism; Feminism. Particular attention to Lenin, Brecht, Hitler, Sartre, Camus, Beckett, Marcuse, Foucault, Woolf and de Beauvoir. General Education credit: Civilization and Culture.

148A. Women and Society in Europe: 1500-1789 (4) III. Kudlick
Lecture—3 hours; term paper. Prerequisite: course 4B recommended. Roles and perceptions of women from the Renaissance to the French Revolution. Emphasis on social and economic factors as well as on discussions of women in the writings of political theorists and social commentators.

148B. Women and Society in Europe: 1789-1920 (4) II. Kudlick
Lecture—3 hours; term paper. Prerequisite: course 4C and 148A recommended. Roles and perceptions of women from the French Revolution to World War I, primarily in France and England. Emphasis on social and economic developments within a loosely chronological and comparative framework.

151A. England: The Middle Ages (4) III. Jestic
Lecture—3 hours; term paper. Prerequisite: course 4A recommended. Origins of England to the accession of the Lancastrians. Survey includes: impact of Norman Conquest on Anglo-Saxon institutions; rise of the Church, common law, parliament, and the economy; thought, arts, and literature to the age of Chaucer and Wyclif.

***151B. England: The Early Modern Centuries** (4) The Staff
Lecture—3 hours; term paper. Prerequisite: courses 4A, 4B; course 151A recommended. From Lancaster and York to the Glorious Revolution. Includes growth of the Church of England; beginnings of modern worldwide economy; rise of the gentry and parliament; thought, arts, and literature in the times of More, Shakespeare, Hobbes, Wren, and Newton.

151C. Eighteenth-Century England (4) I. Landau
Lecture—3 hours; term paper. English history from the Glorious Revolution to the French Revolution. Examination of the transformation of one of Europe's most politically unstable kingdoms into the firmly established constitutional monarchy which provided an environment fit to engender the industrial revolution.

151D. Industrial England (4) III. Landau
Lecture—3 hours; term paper. English history from Waterloo to the Battle of Britain; the rise and continuance of the first industrial nation, examining the transformation of landed to class society, oligarchy to democracy and bureaucracy, Bentham to Bloomsbury, empire to commonwealth.

161A. History of Colonial Spanish America (4) I. C. Walker
Lecture/discussion—3 hours; written reports. Pre-Columbian civilizations of Middle America and the Andean region (mainly Aztec and Inca); the impact of European conquest and colonization; the formation of a hybrid culture. Extensive use of photographic slides. General Education credit: Civilization and Culture.

161B. Latin American History (4) II. Bauer
Lecture/discussion—3 hours; written reports. Evolution of modern Latin America: export economies; oligarchic rule; reform and revolution; the difficulties of the twentieth century. Emphasis on Mexico, Cuba, the Andean region, Chile, and Argentina. Photographic slides.

162. History of the Andean Region (4) III. C. Walker
Lecture/discussion—3 hours; written and/or oral reports. History of the Andean region, the area that now comprises modern Peru, Bolivia, and Chile, from the beginning of human settlement to the present.

***163A. History of Brazil** (4) III. The Staff
Lecture—3 hours; written reports. The history of colonial and imperial Brazil from 1500 to 1889. Offered in alternate years.

***163B. History of Brazil** (4) III. The Staff
Lecture—3 hours; written reports. The history of the Brazilian republic from 1889 to the present. Offered in alternate years.

***164. History of Chile** (4) II. Bauer
Lecture—3 hours; term paper. Prerequisite: course 161A, 161B, 165, or 168 recommended. Emphasis on the history of Chilean political economy from 1930 to the present. Various strategies of development (modernization, Marxism, Neo-Liberalism); the rise of mass politics; the course of foreign relations; and the richness of Chilean literature. Offered in alternate years.

165. Latin American Social Revolutions (4) III. Bauer
Lecture—3 hours; written reports. Major social upheavals since 1900 in selected Latin American nations; similarities and differences in cause, course, and consequence. General Education credit: Contemporary Societies.

***166A. History of Mexico to 1848** (4) III. Bauer
Lecture/discussion—3 hours; written and/or oral reports. Political, economic, and social development of pre-Columbian, colonial and national Mexico to 1848. Offered in alternate years.

***166B. History of Mexico Since 1848** (4) III. The Staff
Lecture/discussion—3 hours; written and/or oral reports. History of Mexico from 1848 to the present. Offered in alternate years.

***168W. History of Inter-American Relations** (4) II. The Staff
Lecture—3 hours; written reports. Diplomatic history of Latin America since independence, intra-Latin American relations, relations with the United States, participation in international organizations, and communism in Latin America.

169A. Mexican-American History (4) II. The Staff
Lecture/discussion—3 hours; written and/or oral reports. Economic, social, religious, cultural and political development of the Spanish-speaking population of the Southwestern United States from about 1800 to 1910. General Education credit: Civilization and Culture.

***169B. Mexican-American History** (4) II. The Staff
Lecture/discussion—3 hours; written and/or oral reports. Role of the Mexican and Mexican-American or Chicano in the economy, politics, religion, culture and society of the Southwestern United States since 1910. General Education credit: Civilization and Culture.

170A. Colonial America (4) I. The Staff
Lecture—3 hours; term paper. Colonial society from 1607 to the American Revolution, with emphasis on European expansion, political, social and economic foundations, colonial thought and culture, and imperial rivalry.

***170B. The American Revolution** (4) The Staff
Lecture—3 hours; term paper. Analysis of the Revolutionary epoch with emphasis on the structure of British colonial policy, the rise of revolutionary movements, the War for Independence and its consequences, and the Confederation period.

***170C. The Early National Period, 1789-1815** (4) III. The Staff
Lecture—3 hours. Political and social history of the American republic from the adoption of the Constitution through the War of 1812 and its consequences.

***171A. The Jacksonian Era** (4) The Staff
Lecture—3 hours. Political and social history of the American republic from the end of the War of 1812 to the Compromise of 1850.

***171B. U.S. Civil War: Politics and Society** (4) I. The Staff
Lecture/discussion—3 hours; term paper. Social crisis, 1848-1877: slavery and the West, new political parties, secession, mobilization and emancipation, economic nationalism and Reconstruction (for military aspects, see course 173).

174A. The Emergence of Modern America, 1876-1914 (4) II. Marchand
Lecture—3 hours; term paper. Rise of modern business and labor organizations, changing political insti-

tutions, the culmination and decline of Victorian culture, and the reaction of muckrakers, Populists, socialists, feminists and social reformers to industrialization and urbanization.

***174B. America in War, Prosperity and Depression, 1914-1945** (4) Marchand

Lecture—3 hours; term paper. America's emergence as a world power, the business culture of 1920s, the New Deal and World War II. Emphasis on such issues as government regulation of the economy, welfare capitalism, and class, racial, ethnic and gender conflicts.

174C. The United States Since World War II, 1945 to the Present (4) III. M. Smith

Lecture—3 hours; term paper. America's struggle to respond to new complexities in foreign relations, social tensions, family changes and media. Emphasis on such topics as: Cold War; anticommunist crusade; civil rights, feminist and environmentalist movement; New Left; counterculture; Vietnam; Watergate; and the moral majority.

***174D. Selected Themes in Twentieth-Century American History** (4) The Staff

Lecture—3 hours; term paper. Prerequisite: course 17B or the equivalent or consent of instructor. Interpretive overview of a single topic in twentieth-century America with emphasis on the phases and processes of historical change.

***175A. Intellectual History of the United States** (4) The Staff

Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: course 17A or the equivalent; or a course in philosophy since the Renaissance, political theory, American literature, or sociological theory. American thought from the Puritans through the era of the American Enlightenment. General Education credit: Civilization and Culture.

***175B. Intellectual History of the United States** (4) II. The Staff

Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: courses 17A and 17B or the equivalent; or a course in philosophy since the Renaissance, political theory, American literature, or sociological theory. Nineteenth-century American thought from the 1820s to about 1900, emphasizing Transcendentalism, Jacksonian democratic thought, the impact of Darwinism, and pragmatism.

***175C. Intellectual History of the United States** (4) III. The Staff

Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: courses 17A and 17B or the equivalent; or a course in modern political theory, philosophy, American literature, or sociological theory. Twentieth-century American thought from about 1900 to the 1960s, emphasizing pragmatic liberalism, naturalism in law and literature, protestant liberalism and neo-orthodoxy, Freudian currents in social thought and social criticism of the 1960s.

176A. Cultural and Social History of the United States (4) I. The Staff

Lecture—3 hours; term paper. Study of social and cultural forces in American society in the nineteenth century with emphasis on social structure, work and leisure, socialization and the family, social reform movements and changes in cultural values.

***176B. Cultural and Social History of the United States** (4) III. Haltunen

Lecture—3 hours; term paper. Study of social and cultural forces in American society in the twentieth century with emphasis on social structure, work and leisure, socialization and the family, social reform movements and changes in cultural values.

***177A. History of Black People and American Race Relations** (4) II. Walker

Lecture—3 hours; term papers. Prerequisite: course 17A or 17B. Afro-American history. History of black people in the United States from African background to Reconstruction. General Education credit: Civilization and Culture.

177B. History of Black People and American Race Relations (4) I. Walker

Lecture—3 hours; term papers. Prerequisite: course 17A or 17B. Afro-American history. History of black people in the United States from Reconstruction to the present. General Education credit: Civilization and Culture.

***180A. Growth of American Politics to 1815** (4) The Staff

Lecture—3 hours; extensive reading and supervised writing. The growth of American politics from the early settlements to 1815 focusing on the distribution of power, its change over time and the ways power has been used. Examines political party development and the social and ideological dimensions of political behavior.

180B. Growth of American Politics, 1815-1890 (4) I. The Staff

Lecture—3 hours; extensive reading and supervised writing. Continuation of course 180A.

***180C. Growth of American Politics, 1890 to the Present** (4) III. The Staff

Lecture—3 hours; extensive reading and supervised writing. Continuation of course 180B.

***181. Religion in American History to 1900** (4) The Staff

Lecture—2 hours; discussion—1 hour; oral and written reports. Religious ideas and institutions from the Puritans to about 1900. Survey of the large-scale social changes associated with revivalism and the great awakenings and the movement from Protestant orthodoxy to pluralism in industrial America.

***183A. The Frontier Experience: Trans-Mississippi West** (4) III. The Staff

Lecture—3 hours; written and/or oral reports. The fur trade, western exploration and transportation, the Oregon Country, the Greater Southwest and the Mexican War, the Mormons, mining discovery, and the West during the Civil War.

***183B. The Frontier Experience: Trans-Mississippi West** (4) II. M. Smith

Lecture—3 hours; written and/or oral reports. Spread of the mining kingdom, the range cattle industry, Indian-military affairs, settlement of the Great Plains and Rocky Mountain Regions and political organization of the West.

***185A. History of Science in America** (4) I. The Staff

Lecture—3 hours; research paper. Survey of the European background. Study of American scientific institutions, ideas, personalities, creative processes in science, and of relationships between society and science from colonial times to present.

***185B. History of Technology in America** (4) Smith
Lecture—3 hours; research paper. Study of American technology, emphasizing biographical approach to historical understanding of technological change, creative processes, institutions, ideas, and relationships between technology and society from colonial times to present.

***187A. American Business History to the 1880s** (4) The Staff

Lecture—3 hours; term paper. Changes in the role of entrepreneurs, organizations, and management practices from the colonial period to the 1880s, with emphasis on the transition from mercantile capitalism to industrial capitalism, marketing, financial intermediaries, and concentration. Offered in alternate years.

***187B. American Business History, 1880s to the Present** (4) The Staff

Lecture—3 hours; term paper. Changes in the role of entrepreneurs, organizations, and management practices from the 1880s to the present, with emphasis on the transition from mercantile capitalism to industrial capitalism, marketing, financial intermediaries, and concentration. Offered in alternate years.

***188A. History of Agriculture in the U.S. to 1900** (4) The Staff

Lecture—3 hours; term paper. Agricultural settlement and development in the U.S., with emphasis on government policies, economic and social institutions. Offered in alternate years. General Education credit: Civilization and Culture.

***188B. History of Agriculture in the U.S. since 1900** (4) II. The Staff

Lecture—3 hours; term paper. Agricultural settlement and development in the U.S. with emphasis on government policies, economic and social institutions. Offered in alternate years. General Education credit: Contemporary Societies.

189A. History of California (4) III. The Staff

Lecture—3 hours; written and/or oral reports. Spanish exploration and settlement; the mission as a frontier institution; revolt of the Californios; penetration by Mountain Men; pioneer trails and settlement; Bear Flag Revolt and Mexican War.

***189B. History of California** (4) I. M. Smith

Lecture—3 hours; written and/or oral reports. State constitution; land grant and Indian policies; Gold Rush; vigilantes; railroad construction; the wheat era; changing economy; social and literary developments; Progressive reform.

***189C. History of California** (4) The Staff

Lecture—3 hours; written and/or oral reports. Impact of World War I; conservative reaction of the 1920s; rise of organized labor; the automobile and moving picture industry; New Deal developments; changes with World War II; role of minorities; contemporary politics.

190A. Late Imperial China: Background to Revolution (4) I. Bossler

Lecture—3 hours; discussion—1 hour; two papers. Patterns and problems of Chinese life traced from the late Ming through the Ch'ing period. Readings include primary sources (including fiction) in English translation on social and intellectual history. Offered in alternate years.

***190B. The Chinese Revolution** (4) The Staff

Lecture—3 hours; discussion—1 hour; term paper. Analysis of China's cultural and political transformation from Confucian empire into Communist state. Emphasis on emergence and triumph of peasant revolutionary strategy (to 1949), with some attention to its implications for post-revolutionary culture and politics. Offered in alternate years.

***190C. History of the People's Republic of China** (4) The Staff

Lecture—3 hours; discussion—1 hour; two papers. Comprehensive analysis of recent Chinese history, including land reform, the Cultural Revolution, the post-Mao era, and the consequences of the new economic policies of the 1980s. Offered in alternate years.

***191A. Classical China** (4) The Staff

Lecture—3 hours; term paper. History of Chinese civilization from its origins through the establishment of city states and the flowering of classical philosophy, to the rise and fall of the First Empire.

***191B. High Imperial China** (4) The Staff

Lecture—3 hours; term paper. Political disunion and the influx of Buddhism; reunification under the great dynasties of T'ang, Sung, and Ming with analysis of society, culture and thought.

191C. Late Imperial China (4) I. Mann

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: course 9A or upper division standing. Patterns and problems of Chinese life traced through the Ming and Ch'ing dynasties (c. 1500 - 1800), prior to the confrontation with the West in the Opium War. Readings include primary sources and novels portraying elite ethos as well as popular culture. Offered in alternate years.

191D. Nineteenth Century China: The Empire Confronts the West (4) II. Bossler

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: course 9A, or upper division standing. The decline and fall of the Chinese Empire, with particular attention to the social and political crises of the 19th century, and the response of government officials, intellectuals, and ordinary people to the increasing pressures of Western imperialism.

***192. Internship in History** (1-12) I, II, III. The Staff (Chairperson in charge)

Prerequisite: enrollment dependent on availability of intern positions, with priority to History majors. Supervised internship and study as historian, archivist, curator, or in another history-related capacity, in an

approved organization or institution. (P/NP grading only.)

***193. History of the People's Republic of China, 1949 to the Present** (4) III. Mann
Lecture—2 hours; discussion—1 hour; term paper. Comprehensive analysis of recent Chinese history, including land reform, the Cultural Revolution, the post-Mao era, and China's foreign relations from 1949 to the present. Offered in alternate years.

194A. Aristocratic and Feudal Japan (4) III. Borgen
Lecture—3 hours; term paper and/or discussion. Broad survey of the cultural, social, religious, and political aspects of Japanese history from mythological times through the sixteenth century emphasizing comparison of the organizations, values, and beliefs associated with the aristocratic and feudal periods. Offered in alternate years.

***194B. Early Modern Japan** (4) III. The Staff
Lecture—3 hours; term paper and/or discussion. Survey of the cultural, social, economic, and political aspects of Japanese history from the seventeenth through the nineteenth centuries emphasizing the development of those patterns of thought and political organization with which Japan met the challenge of the nineteenth-century Western expansionism.

***194C. Modern Japan** (4) II. The Staff
Lecture—3 hours; term paper and/or discussion. Survey of the cultural, social, economic, and political aspects of Japanese history in the twentieth century emphasizing labor and social movements, militarism and the Pacific war, and the emergence of Japan as a major economic power.

***194D. Business and Labor in Modern Japan** (4) I. The Staff
Lecture—3 hours; term paper or papers. Survey of labor and management relations in Japan from the mid-eighteenth century to the present. Offered in alternate years.

***194E. Education and Technology in Modern Japan** (4) I. The Staff
Lecture—3 hours; term papers. Survey of education and technology in Japan from the mid-eighteenth century to the present. Offered in alternate years.

196A. Medieval India (4) I. The Staff
Lecture—3 hours; discussion—1 hour; written reports. Survey of history of India in the millennium preceding arrival of British in the eighteenth century, focusing on interaction of the civilizations of Hinduism and Islam and on the changing nature of the state.

***196B. Modern India** (4) II. Metcalf
Lecture—3 hours; discussion—1 hour; written reports. Survey of cultural, social, economic, and political aspects of South Asian history from arrival of the British in the eighteenth century to formation of new independent states—India, Bangladesh, and Pakistan—in the twentieth century.

***197T. Tutoring in History** (2) The Staff (Chairperson in charge)
Discussion—1 hour; laboratory—3 hours. Prerequisite: enrolled as a History major with senior standing and consent of department chairperson. Tutoring of students in lower division courses. Weekly meeting with instructors in charge of courses. Written reports on methods and materials required. May be repeated once for credit. No final examination. (P/NP grading only.)

***198. Directed Group Study** (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor; upper division standing. (P/NP grading only.)

***199. Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

201A-S. Sources and General Literature of History (4) I, II, III. The Staff
Seminar—3 hours; term paper. Designed primarily for students preparing for higher degrees in history. (A) Ancient; (B) Medieval; (C) Renaissance and Reformation; (D) Early Modern Europe; (E) Europe

since 1815; (F) China to 1880; (G) China since 1880; (H) Britain; (I) Latin America since 1810; (J) American History to 1787; (K) United States, 1787-1896; (L) United States since 1896; (N) Modern Japan; (O) Cross-Cultural Women's History; (S) History of Science and Medicine. May be repeated for credit when different subject area is studied.

202A-K. Major Issues in Historical Interpretation (4) I, II, III. The Staff
Seminar—3 hours; term paper. Prerequisite: graduate standing. Fundamental issues and debates in the study of history. (A) Ancient; (B) Medieval Europe; (C) Modern Europe; (D) India; (E) Africa; (F) China; (G) Japan; (H) United States; (I) Latin America; (K) Britain. Readings, papers, and class reports. May be repeated for credit when a different subject area is studied.

203. Seminar Research (4) II. The Staff (Chairperson in charge)
Seminar—3 hours. Prerequisite: consent of instructor. Designed primarily for students preparing for higher degrees in History. Individual research and analysis resulting in substantial research paper. May be repeated for credit.

204A. Historiography (4) I. Brower (Chairperson in charge)
Seminar—3 hours; research paper. Prerequisite: consent of instructor for non-History graduate students. Introduction to major works of historical scholarship from the Greeks to the present.

***204B. New Methods of Historical Research** (4) The Staff (Chairperson in charge)
Seminar—3 hours; research paper. Prerequisite: consent of instructor for non-History graduate students. Introduction to basic historical data, to the methods currently employed in historical research, and to the problems of presenting findings in a literary form.

***211. Ancient History** (4) The Staff
Seminar—3 hours. Prerequisite: courses 111A, 111B, 111C. Seminar dealing with the various aspects of Near Eastern and Greco-Roman civilization.

***221. Medieval History** (4) The Staff
Seminar—3 hours. Prerequisite: courses 121A, 121B, 121C recommended. Topics in the history of medieval and early Renaissance Europe.

***237. Russian History** (4) The Staff
Seminar—3 hours. Prerequisite: a reading knowledge of Russian. Topics relating to the history of Muscovite and Imperial Russia before 1856.

245. Modern European History (4) II. Margadant
Seminar—3 hours. Prerequisite: course 201E. Primary sources and research methodologies in the history of modern France and Germany. May be repeated once for credit.

***261. Latin American History** (4) I, II, III. Bauer
Seminar—3 hours. Prerequisite: two courses in Latin American history; reading knowledge of Spanish or Portuguese.

271A-271B. United States History (4-4) II-III. The Staff
Seminar—3 hours; term paper. Prerequisite: course 201J-L or 202H. Research in literature, methods, and sources on aspects of United States history, culminating in each student completing a research paper in the field by the end of the second quarter.

***273A-273B. Research Seminar in the Comparative History of Women and the Family** (4-4) I-II. Rosen
Seminar—3 hours; paper. Research in literature, methods, and historical approaches to the area of women and the family culminating in each student completing a research paper in this field. (Deferred grading only, pending completion of sequence.)

291A. Chinese History (4) Price, Mann, Bossler
Seminar—3 hours; term paper. Prerequisite: consent of instructor. Research on topic to be chose by the students for the purpose of writing article-length papers. May be repeated for credit. (Deferred grading only, pending completion of sequence.)

291B. Chinese History (4) Price, Mann, Bossler
Seminar—3 hours; term paper. Prerequisite: consent

of instructor. Completion of article-length papers on topics chosen by students. May be repeated for credit. (Deferred grading only, pending completion of sequence.)

291C. Chinese History (4) Price, Mann, Bossler
Seminar—3 hours; term paper. Prerequisite: consent of instructor. Readings in Chinese historical materials. Training in the use of Chinese reference works. May be repeated once for credit.

***292. College Teaching Internship** (4) I, II, III. The Staff
Internship—4 hours. Prerequisite: course 300 (may be taken concurrently). Student prepares and teaches one lower division history course in a nearby community college under the supervision of a UC Davis instructor and a community college instructor. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

***300. Teaching History in the Community College** (3) I. The Staff
Discussion-laboratory—3 hours. Prerequisite: graduate standing. Designed for MAT students. Methods for the presentation of history at the community college and secondary school level. (S/U grading only.)

389. Introductory Seminar for Teaching Assistants (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: must be enrolled in History 390. An introduction to the broad comparative and theoretical issues of teaching methods and technique in history. (S/U grading only.)

390. Teaching History in College (2) I, II, III. The Staff
Discussion—2 hours. Designed for teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the university. (S/U grading only.)

History and Philosophy of Science

(College of Letters and Science)
James R. Griesemer, Ph.D., Program Director
Program Office, Social Sciences and Humanities Building (916-752-9621)

Committee in Charge

Betty Jo T. Dobbs, Ph.D. (History)
Michael R. Dietrich, Ph.D. (History and Philosophy of Science)
Paula E. Findlen, Ph.D. (History)
James R. Griesemer, Ph.D. (Philosophy)
Michael Smith, Ph.D. (History)
Paul Teller, Ph.D. (Philosophy)

The Program. The interdisciplinary minor in the history and philosophy of science invites students to examine historical and contemporary problems in a variety of scientific disciplines, and to explore concepts and procedures basic to science and how they have evolved. The minor is sponsored by the Program in the History and Philosophy of Science.

Minor Program Requirements:

	UNITS
History and Philosophy of Science	24
Philosophy 104	4
History 135A or 135B	4

*Course not offered this academic year.

Four courses from those listed below. One course must be from each of three areas: (a) history, (b) philosophy, and (c) history and philosophy of science.....16
 (a) History 102, 136, 139A, 139B, 185A, 185B, 188A, 188B;
 (b) Philosophy 106, 107, 108, 109, 110, 111;
 (c) History and Philosophy of Science 20, 130A, 130B, 150, 180.

Minor adviser. M. Dietrich, Humanities/Social Science Building, 916-752-3709.

Courses in History and Philosophy of Science (HPS)

Lower Division Courses

20. Cosmic Origins and Structures: Scientific and Non-Scientific Theories (4) II. Dobbs

Lecture/discussion—3 hours; term paper. Broad cultural survey of cosmogonies and cosmologies from several societies. Non-technical study of developments in Western culture that produced the cosmologies of Plato, Newton, and Einstein; also cosmological schemes of astrologers, alchemists, Christian mystics, women, and Native Americans. General Education credit: Civilization and Culture.

*90X. Lower Division Seminar (1-2) I, II, III. The Staff (Chairperson in charge)

Seminar—1-2 hours. Prerequisite: lower division standing and consent of instructor. Examination of a special topic in History and Philosophy of Science through shared readings, discussions, written assignments, or special activities such as films, library work, archival work, etc. May be repeated once for credit when content differs. Limited enrollment.

Upper Division Courses

130A. From Natural History to the History of Nature (4) III. Findlen

Lecture/discussion—3 hours; term paper. Prerequisite: History 135A recommended. Evolution and demise of natural history as a discipline from Aristotle to Linnaeus. Considers ancient views of nature and its Renaissance rediscovery; the emergence of biology, botany, geology, and zoology; the history of taxonomy and classification. General Education credit: Civilization and Culture or Nature and Environment.

130B. History of Modern Biology (4) II. Dietrich
 Lecture/discussion—3 hours; term paper. Prerequisite: course 130A recommended. Development of modern biology from pre-Darwinian roots to the present. Considers emergence of modern biological specialties and consolidation of biological theory around evolutionary ideas. History of allied fields such as genetics, paleontology, embryology, ecology, systematics and molecular biology. General Education credit: Civilization and Culture or Nature and Environment.

150. Gender and Science (4) III. Dietrich
 Lecture/discussion—3 hours; term paper. An interdisciplinary approach to the relations between gender and science. Topics include the biological and cultural construction of sexual difference, the role of women as practitioners of science, and feminist approaches to science.

*180. Topics in History and Philosophy of Science and Technology (4) II. The Staff

Seminar—3 hours; term paper. Prerequisite: course in History and Philosophy of Science or other course work relevant to the particular offering. In-depth treatment of selected topics in the history and philosophy of science. Possible topics include: history of modern physics, history of molecular biology, science and society, scientific explanation, technology and culture, theory testing.

198. Directed Group Study

(1-5) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

250. History and Philosophy of Science (4) III.

Dietrich
 Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Interdisciplinary seminar in the history and philosophy of science. Focuses on issues such as historiography, methodology, and the conceptual foundations of science. May be repeated for credit with consent of instructor.

298. Group Study (1-5) I, II, III. The Staff (Director in charge)
 Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Director in charge)
 Prerequisite: consent of instructor. (S/U grading only.)

Horticulture (A Graduate Group)

David W. Burger, Ph.D., Chairperson of the Group
 Group Office, 140 Environmental Horticulture

Faculty. The faculty includes departmental members of Environmental Design, Environmental Horticulture, Entomology, Plant Pathology, Pomology, Vegetable Crops, and Viticulture and Enology.

Graduate Study. The Graduate Group in Horticulture offers programs of study leading to the M.S. degree. The programs provide opportunities for specialized study of the production, management, and utilization of horticultural plants and the postharvest handling of horticultural commodities. Areas of specialization include: floriculture, nursery production, landscape horticulture, pomology, vegetable crops, and viticulture. Research may be conducted on an applied or basic problem having a physiological, genetic, or ecological emphasis.

Preparation. A level of competence equivalent to that of a sound undergraduate program in Plant Science is required. This includes course work in general botany, chemistry, physics, statistics, genetics and introductory plant physiology. A few limited deficiencies in any of these areas can be made up after admission to the graduate program. Specific requirements are outlined in detail and may be obtained from the Group Office.

Graduate Advisers. Consult the Group Office.

Courses in Horticulture (HRT)

Graduate Courses

251. Modeling Horticultural Systems (3) II. Lieth
 Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 101, calculus, or consent of instructor. Introduces students to systems modeling. Primary emphasis on physiological and ecological models with examples drawn from areas of interest to class participants. Applications to horticultural systems will be explored. Students will receive hands-on experience.

290. Seminar (1) I, II, III. The Staff
 Seminar—1 hour. Prerequisite: graduate standing at UCD. Seminars presented by invited speakers, students, or faculty on selected topics in horticulture. (S/U grading only.)

Human Anatomy

See Cell Biology and Human Anatomy in Medicine, School of

*Course not offered this academic year.

Human Development

(College of Agricultural and Environmental Sciences)
 L.V. Harper, Ph.D., Chairperson of the Division

Faculty

Curtis R. Acredolo, Ph.D., Adjunct Associate Professor
 Carolyn Aldwin, Ph.D., Associate Professor
 Keith Barton, Ph.D., Professor
 Brenda Bryant, Ph.D., Professor
 James Chisholm, Ph.D., Associate Professor
 Lawrence Harper, Ph.D., Professor
 Rosemarie Kraft, Ph.D., Associate Professor
 Beth Ober, Ph.D., Associate Professor
 Carol Rodning, Ph.D., Assistant Professor
 Emmy Werner, Ph.D., Professor

Emeriti Faculty

Louise Bachtold, Ed.D., Professor Emeritus
 Glenn Hawkes, Ph.D., Professor Emeritus
 David Lynn, Ph.D., Professor Emeritus

The Major Program

Human development explores the developmental process in humans throughout the life cycle. Cognitive and personality/social development are studied from various perspectives.

The Program. Human development majors complete a group of preparatory courses in anthropology, biological sciences, genetics, nutrition, physiology, psychology, statistics, and human development. Upper division students can design their programs in consultation with a faculty member to emphasize a particular interest. For instance, students can study the social and the biological aspects of human development while emphasizing child or adult development.

Internships and Career Alternatives. At least one practicum course is required. A second practicum or supervised internship can be used to fulfill the requirements for the major. In addition, students can intern in schools, early childhood education centers, hospitals, rehabilitation centers, probation offices, group foster homes, mental health clinics, or as tutors for handicapped and bilingual students. Human development graduates fill a wide variety of positions in preschools, elementary and special educational settings, as well as governmental jobs related to social welfare and recreation. Those who emphasize the biological aspect of human development can apply to medical school or pursue training for para-medical positions within the health sciences. Human development prepares students to pursue advanced degrees in the behavioral sciences, education, child guidance, social welfare, health sciences, or further research in human development. Graduate study is available through a Master of Science degree in child development, and a Ph.D. degree in human development.

B.S. Major Requirements:

(For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. Courses shown without parentheses are required.)

UNITS

English Composition Requirement10-12
 See College requirement0-8
 Additional English (choose from English 102, 103, 104)3-4

Preparatory Subject Matter38-44

Anthropology 1, 2, and 1513
 Biological sciences (Biological Sciences 1A† or 10)4-5

† Chemistry 2A is recommended prerequisite for Biological Sciences 1A. Biological Sciences 1A is prerequisite for Biological Sciences 1B.

Genetics (Molecular and Cellular Biology 10 or Biological Sciences 101)4

Human development (Human Development 30)4
 Nutrition (Nutrition 10 or 101).....3-5
 Physiology (Neurobiology, Physiology and Behavior 10 or 110)4-5
 Psychology (Psychology 1 or 15)3-4
 Statistics (Education 114, Psychology 41, Sociology 46A and 46B, or Statistics 13)4
Breadth/General Education.....24-32
 Satisfaction of General Education requirement16-24
 American history/American government (History 17A, 17B, 17C, 72A, 72B, and Political Science 1 are recommended courses)8
Depth Subject Matter52-53
 Human Development 100A, 100B, 100C, 11016
 Social-cultural processes (Human Development 102 or 103)4
 Assessment (Human Development 120 or 121)4
 Cognitive processes (Human Development 101 or 132)4
 Exceptional children (Human Development 130 or 131)4
 Practicum (Human Development 140-140L, or 141 or 142 or 143)4-5
 Four additional upper division courses chosen from the Human Development courses or from a list of restricted electives (in consultation with faculty adviser)16
Unrestricted Electives39-72
Total Units for the Degree180

Major Adviser. K. Barton, L. Harper.

Related Major Program. See the major in Applied Behavioral Sciences.

Minor Program Requirements:

UNITS

Aging and Adult Development.....21-27
 Human Development 100C, 160, 1918
 Community Health 1803
 Human Development 110, Applied Behavioral Sciences 1738
 Practicum, 2 units minimum2-8
Minor Adviser. C. Aidwin, B. Ober.

UNITS

Human Development.....20
 Human Development 100A4
 Human Development 100B or 100C4
 Human Development 110 or 103 or 1514
 Two courses from Human Development 101, 102, 130, 131, or 1328
Minor Adviser. L. Harper.

Graduate Study. Refer to the Graduate Studies section in this catalog.

Courses in Human Development (HDE)

Questions pertaining to the following courses should be directed to the instructor or to the Applied Behavioral Sciences Advising Office, 1303 Hart Hall (916-752-2244).

Lower Division Courses

12. Human Sexuality (2) I, II, III. The Staff
 Lecture—2 hours. Vocabulary; structure and function of genital system; sexual response; menstruation; fertility; birth control; pregnancy and childbirth; sex in religion and law; sex education; homosexuality; masturbation; establishing and maintaining intimacy; intimate communication; attitudes and values; sexual dysfunctions; lovemaking. (P/NP grading only.)

15. Family and the Life Cycle (4) III. Chisholm
 Lecture—4 hours. Prerequisite: Psychology 1, or 15 and 16. Socialization in families throughout the life cycle. Impact of alcoholism and abuse. Sources of strength and help. Not open for credit to students who have completed courses 100A, 100B, 110 and/or Psy-

chology 112, 114, and 115. General Education credit: Contemporary Societies.

19. Life Cycles, Kinship, and Growth in Human Populations (4) II. Carey
 Lecture—3 hours; discussion—1 hour. Human populations at different levels of organization; including life course, family life cycle, race, ethnicity, genealogy, and population traits and changes. General Education credit: Nature and Environment.

30. Observation Techniques in Human Development (4) I, II, III. The Staff
 Lecture—3 hours; laboratory—3 hours. Prerequisite: Psychology 1 and consent of instructor. Observational techniques used in the study of human behavior and development, with focus on ages six months to five years; analysis and use of observational data. *Students may not pre-enroll for this course, but must sign up for laboratory time at the Early Childhood Laboratory prior to in-person enrollment.*

98. Directed Group Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
 (P/NP grading only.)

Upper Division Courses

100A. Infancy and Early Childhood (4) I. Harper; II. Acredolo
 Lecture—4 hours. Prerequisite: Psychology 1 or 15, Biological Sciences 1A or 10. Analysis of the biological, social, and cultural influences in the psychological growth and development of children, prenatal through age six.

100B. Middle Childhood and Adolescence (4) II. L. Acredolo; III. The Staff
 Lecture—4 hours; three brief observations of school-age children. Prerequisite: course 100A or the equivalent; introductory biology. Analysis of the interplay of biological and social-cultural factors in the emotional, cognitive and social development from middle childhood through adolescence.

100C. Adulthood and Aging (4) III. Ober
 Lecture—4 hours. Prerequisite: Psychology 1 or 15. Development during early, middle, and late adulthood; biological, cognitive, and psycho-social aspects of adult development. Emphasis on normative patterns of development which characterize "successful aging."

101. Cognitive Development (4) I. Goodman
 Lecture—4 hours. Prerequisite: courses 100A and 100B, or Psychology 112. Theories of cognitive development including developmental views of perception, learning, memory, concept formation, and language.

102. Social and Personality Development (4) II. Rodning
 Lecture—3 hours; discussion—1 hour. Prerequisite: introductory psychology; course 100B or the equivalent. Theories of development of a child's personality through interactions with children and adults; development of interpersonal and culturally valued skills.

103. Cross-Cultural Study of Children (4) III. Chisholm
 Lecture—4 hours. Prerequisite: course 100A or consent of instructor. Cross-cultural studies of children in developing countries and among minority groups in the U.S.

110. Contemporary American Family (4) III. Chisholm
 Lecture—4 hours. Prerequisite: introductory psychology. Factors currently influencing American families including changing economic conditions, changing sex roles, divorce, and parenthood; theories and research on family interaction.

120. Research Methods in Human Development (4) II. Barton
 Lecture—3 hours; laboratory/discussion—1 hour. Prerequisite: courses 100A and 100B; elementary statistics. Research methods in selected areas of human development (i.e., infancy, learning, cognition, personality).

121. Psychological Assessment (4) I. Barton; III. The Staff
 Lecture—4 hours. Prerequisite: courses 100A-100B; elementary statistics. Current issues and methodology related to the process of psychological assessment with children.

130. Emotionally Disturbed Children (4) I. Bryant
 Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100A and 100B or consent of instructor. Discussion of psychosis, neurosis, behavior disorders, and learning difficulties in children.

131. Developmental Disabilities (4) II. The Staff
 Lecture—2 hours. Prerequisite: course 100A or consent of instructor. Mental retardation and special learning disabilities, etiology, diagnosis, education and socialization. Introduction to community resources.

132. Individual Differences in Giftedness (4) III. Kraft
 Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100A and 100B or consent of instructor. Conceptualization, identification and education of the intelligent, the creative, and the talented, gifted individual.

140. Communication and Interaction with Young Children (2) I, II, III. Stockman
 Lecture—2 hours. Prerequisite: courses 30A, 100A, and 140L (may be taken concurrently) recommended. Theory and practice in the area of effective interaction with young children. Humanistic, child-centered approaches; awareness of goals, beliefs, and values as these affect interactions. *Students may not pre-enroll for this course, but must sign up for laboratory time at the Early Childhood Laboratory prior to in-person enrollment.*

140L. Laboratory in Early Childhood (3-6) I, II, III. Stockman
 Discussion—1-3 hours; laboratory—6-12 hours. Prerequisite: course 140 (may be taken concurrently). Application of theories of learning and development to interaction with children six months to five years at Early Childhood Laboratory. Applied skills in communication, discipline and curriculum. May be repeated for credit for a total of 12 units.

141. Field Studies with Children and Adolescents (4-6) II. The Staff; III. Kraft
 Discussion—2 hours, field study—6-12 hours. Prerequisite: course 100B or the equivalent and consent of instructor. Study of children's affective, cognitive and social development within the context of family/school environments, hospitals and foster group homes. May be repeated for credit for a total of 12 units following consultation with and consent of instructor.

142. Field Studies with Exceptional Children (4-6) I. Bryant
 Discussion—1 1/2 hours; field study—6-12 hours. Prerequisite: consent of instructor and one course from courses 130, 131, or 132 (may be taken concurrently). Field study with children who are identified as developmentally disabled, emotionally distressed, or intellectually gifted. May be repeated for credit for a total of 12 units following consultation with and consent of instructor.

143. Field Studies of the Elderly (4-6) II. Ober
 Fieldwork—8-12 hours; discussion—1.5 hours. Prerequisite: course 100C or 160 may be taken concurrently. To apply theory and research on adult development and aging, to work with older adults in a variety of settings, and to develop skills relevant to that application. Students will also develop a small research project. Offered alternately winter quarter of one year, then in spring quarter the next year.

***150. Supervision and Administration of Early Childhood Education Programs (4) I.** The Staff
 Lecture—40 hours total. Prerequisite: course 140 or prior experience in an early childhood education program. History of early childhood programs in California; federal, state and local regulations. Implications of different regulations for funds and budgets, policy making mechanisms, professional and legal responsibilities, staff development, and professional attitudes and issues. Offered in alternate years.

*Course not offered this academic year.

151. Shared Child Care (4) II. Werner

Lecture—4 hours. Prerequisite: courses 100A or 110, Psychology 112, or Anthropology 131. Examines roles of caregivers other than parents in contemporary society, and the impact of grandparents, siblings, family day care providers, foster parents, church- and employer-sponsored child care on children's development. Reviews child care legislation and social policy issues.

160. Social Aspects of Aging (4) II. Aldwin

Lecture—4 hours. Prerequisite: course 100C or Psychology 115. How the social context affects adult development and aging. Emphasis on demography, social policy, culture, and adaptation. Oral histories as class projects.

162. Issues in Aging (3) I. Aldwin

Lecture—2 hours; lecture/discussion—1 hour. Prerequisite: course 100C or 160. Research and policy issues concerning the elderly and aging in contemporary society.

190C. Introductory Research Conference (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: involvement in ongoing research. Instructors lead discussions with undergraduate students who involve themselves in a research project. Research papers are reviewed and aspects of project proposals developed out of class are presented and evaluated. May be repeated for credit. (P/NP grading only.)

***191. Proseminar: Issues in Aging** (2) I. The Staff Seminar—2 hours. Prerequisite: upper division standing. Discussion of selected critical issues in aging.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: upper division standing and consent of instructor. Supervised internship off and on campus, in community, and institutional settings. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses**200A. Early Development** (4) I. Harper

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing; basic biology/physiology; one upper division course in psychology or a related field; one upper division or graduate course in developmental psychology (may be taken concurrently). Theory and research on the biological, social, cognitive, and cultural aspects of development from conception to the age of five years.

200B. Middle Childhood and Adolescence (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing; basic biology or physiology, and at least two upper division or graduate-level courses in psychology or related fields. Theory and research on biological, cognitive, social, and cultural influences on behavioral development from age five years until late adolescence.

200C. Development in Adulthood (4) III. Ober

Lecture/discussion—4 hours. Prerequisite: course 200A and 200B. Theory and research focusing on social, personality, cognitive, and biological development from early to late adulthood. Emphasis is on theory development and continuity and change.

201. Social-Emotional Development in Infancy (4) II. Rodning

Lecture/discussion—4 hours. Prerequisite: course 200A. Analysis of theory, methods, and research on social-emotional development in infancy. Emphasizes the development of primary and secondary emotions, and the development of attachment. Other possible topics include infant temperament, sex differences, compliance, and self-regulation. Offered in alternate years.

203. Development in Middle Childhood (3) I. Bryant

Seminar—3 hours. Prerequisite: graduate standing; some background in developmental psychology or human development; consent of instructor. Critical evaluation of current theory and research regarding normal and "abnormal" development in middle childhood. Emphasizes social-emotional development in varying contexts (family, school, neighborhood) and considers the interplay of cognitive, biological, social, and emotional processes during middle childhood. Offered in alternate years.

***210. Theories of Behavioral Development** (3) III. The Staff

Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing in behavioral sciences. Consideration of enduring issues in theories of behavioral development; analysis of adequacy of major theoretical schools (e.g., social learning, Piagetian) as scientific theories. Offered in alternate years.

***211. Physiological Correlates of Behavioral Development** (3) III. Harper

Seminar—3 hours. Prerequisite: consent of instructor. An overview of mechanisms of organismic development and the implications of developmental biology for the analysis of behavioral ontogeny; consideration of parallels between processes of organismic development and behavioral development in children and infra-human mammals.

212. Adaptation and Aging (3) I. Aldwin

Lecture/discussion—3 hours. Prerequisite: course 200C. Interdisciplinary perspective of the ways biological, psychological, and sociocultural factors affect aging and adaptation in late life. Focus is on the ways in which stress, coping, and social support affect health and the factors which contribute to optimal aging. Offered in alternate years.

***213. Cross-Cultural Study of Children** (3) III. The Staff

Lecture—2 hours; discussion—1 hour; field project or paper. Prerequisite: graduate standing in Human Development, Education, Anthropology, Psychology or Sociology. Current theory and research concerned with comparative child development. Introduction into the major issues and methods of cross-cultural research (e.g., biological, cognitive and social development of children in different cultures and subcultures in U.S.A.). Offered in alternate years.

***217. Development of Cortical and Perceptual Laterality** (3) II. Kraft

Seminar—3 hours. Prerequisite: graduate standing in child or human development or consent of instructor. Current theory and research regarding the development of human cortical and perceptual laterality — emphasizing the relationship of this development to thinking and behavior. Offered in alternate years.

220. Research Methods in Human Growth and Development (3) II. Barton

Lecture—3 hours. Prerequisite: Statistics 13 or the equivalent and at least two upper division courses in human biology or developmental psychology. Theory and research methods in biological growth, and cognitive and social/emotional development from prenatal period to death.

221. Psychological Assessment of Children (4) III. Barton

Lecture—2 hours; discussion—2 hours. Prerequisite: course 121 or consent of instructor. Study of children's behavior through examination, analysis and evaluation of perceptual-motor, cognitive, affective and social development. Problems in assessment of exceptional children considered. Assignments focus on preparation of a comprehensive report on one child.

***225. Behavioral Development and Food Intake** (4) III. Pollitt

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Human Development (and related fields) and Nutrition. Multidisciplinary view covering key theoretical and research issues in basic human development processes related to food intake.

***231. Issues in Cognitive and Linguistic Development** (3) III. Kraft

Seminar—3 hours. Prerequisite: consent of instructor. Study and evaluation of key issues in the theoretical and empirical literature on cognitive and linguistic development.

232. Cognition and Aging (3) I. Ober

Lecture/discussion—3 hours. Prerequisite: course 200C. The manner in which cognitive processes are affected by aging as well as an understanding of the changes in the central nervous system occurring with aging. Offered in alternate years.

***237. Parent-Child Interaction** (3) III. The Staff

Seminar—3 hours. Prerequisite: consent of instructor; upper division course on the family recommended. Current theory and research. Emphasis on parental behavior in other animals and other cultures, childrearing practices, the child's perception of parents, the differential influence of each parent on the child's psychological well-being, sex-role development, and moral development. Offered in alternate years.

***241. Consultation Approaches to Child Development** (3) II. Bryant

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: graduate standing; supervised field experience with children (e.g., course 140, 141, 142, may be taken concurrently); and consent of instructor. Analysis and application of theories and approaches of consultation and child development to facilitate delivery of child-related services (e.g., educational and mental health). Develop working knowledge of consultation skills for working with adults directly interacting with children and adolescents. Offered in alternate years.

242. Adolescent Health Behavior: Theory and Programs (2) I. Braverman

Lecture/discussion—2 hours. Prerequisite: graduate standing in child or human development, or consent of instructor; course 200B recommended. Theoretical conceptions relating to adolescent behaviors that have potential impact on health (e.g., use of tobacco, alcohol and other drugs; sexual behavior; accident prevention). Development and evaluation of programs that aim to influence adolescents' behaviors or attitudes in these areas. Offered in alternate years.

246. Sex, Evolution, and Development (4) I. Chisholm

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Human Development or related field. An evolutionary and cross-cultural perspective on the family, with special emphasis on life history theory and parental investment theory and their relevance for understanding the development of alternative mating and parenting strategies in humans.

***290. Seminar** (3) I, II, III. The Staff

Seminar—3 hours. Discussion and evaluation of theories, research, and issues in human development. Different topics each quarter.

290C. Research Conference (1) I, II, III. The Staff Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Supervising instructors lead research discussions with their graduate students. Research papers are reviewed and project proposals are presented and evaluated. May be repeated for credit. (S/U grading only.)

291. Research Issues in Human Development (3) I. Kraft; II. The Staff

Lecture—3 hours. Prerequisite: graduate standing in the behavioral sciences. In-depth presentations of research issues in particular areas of behavioral development.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Human Development (A Graduate Group)

Rosemarie Kraft, Ph.D., Chairperson of the Group
Group Office, 1303 Hart Hall (916-752-1926)

Faculty. Core faculty are developmental psychologists housed in the Division of Human Development. Students may also choose to work with faculty from the Departments of Anthropology, Behavioral Biology, Neuroscience, Nutrition, Psychology, Physiology; the Division of Education; and the Schools of Law and of Medicine.

Graduate Study. The interdisciplinary and interdepartmental Graduate Group in Human Development offers a program of study leading to the Ph.D. degree. The aim of the program is to provide students with a coordinated postgraduate lifespan study of human behavioral development and to educate students in the theories, methods, and accumulating research that provide the basis for current understanding and expanding knowledge of the development of human behavior. The program has a three-pronged structure: (1) It incorporates study in three domains of human development—biological, cognitive, socio-emotional; (2) It organizes the study of human development across the lifespan from conception through aging; and, (3) It emphasizes the internal and external contexts within which human development takes place—cultural institutions such as families, schools, and hospitals, and other contextual conditions such as government/social policy, nutrition, disease, and health/mental health. Recipients of the degree will be prepared to teach, to conduct research, and to be actively involved in public service in human behavioral development.

Humanities

(College of Letters and Science)

Clarence Walker, Ph.D., Program Director

Program Office, Humanities Institute (916-757-3470)

Committee in Charge

Kay Flavell, Ph.D., (*Critical Theory*)

Catherin Kudlick, Ph.D., (*History*)

Jay Mechling, Ph.D. (*American Studies*)

Dario Melossi, Ph.D., (*Sociology*)

Carol Smith, Ph.D. (*Anthropology*)

George Van Den Abbeele, Ph.D. (*French*)

The Program of Study

Courses in the Humanities Program are designed to provide instruction in interdisciplinary areas which do not fit readily into existing departments or programs.

Courses in Humanities (HUM)

Lower Division Course

20A. Privacy in the West (4) II. Murav
Lecture/discussion—3 hours; term paper. Interdisciplinary study of privacy in the West. History of privacy as a positive concept in American constitutional tradition. Supreme Court cases. Privacy as a negative concept in Western religious tradition and Marxism. Privacy and gender, e.g., Anita Hill and Clarence Thomas.

40. Introduction to Computing in the Humanities (4) II. Roddy

Lecture—3 hours; laboratory—3 hours. Survey of current approaches to use of computers in such fields as language, literature, history, art, music, and drama. Laboratory in text creation and analysis.

Upper Division Courses

110A. Interdisciplinary Approaches to Narrative (4) I. Blanchard

Lecture/discussion—3 hours; term paper. Prerequisite: upper division standing. Interdisciplinary approach to contemporary issues (abortion, AIDS, civil rights, war and peace, welfare state) around which individuals, communities and institutions define themselves in American society, by applying principles of narrative theory to the narratives where those issues are embedded. General Education credit: Civilization and Culture.

140. Advanced Computing in the Humanities (4) III. Roddy

Lecture—3 hours; laboratory—3 hours; research project. Prerequisite: course 40 or consent of instructor. The computer as support for the humanities. Topics include advanced textual analysis, editing, vocabulary control, and data base management (design, application and evaluation, and search strategies).

180. Topics in the Humanities (4) I, II, III. The Staff
Lecture/discussion—4 hours; term paper. Analysis of interdisciplinary issues in the humanities. Topics will vary. May be repeated once for credit.

198. Directed Group Study (1-4) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-4) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

250. Topics in Humanities (4) I, II, III. The Staff (Program Director in charge)

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Topics in the humanities, selected by the instructor. May be repeated once for credit.

299. Individual Research (1-4) I, II, III. The Staff (Program Director in charge)

Individual research in the humanities resulting in a formal written research report. (S/U grading only.)

Hydrologic Science

(College of Agricultural and Environmental Sciences)

Faculty. See under Department of Land, Air and Water Resources, Hydrologic Science Section.

The Major Program

Hydrologic Science is the study of the occurrence, distribution, circulation, and behavior of water in the environment of Earth. It includes measurement and analysis of water phenomena in the subsurface, on the Earth's surface, and in the atmosphere for the purpose of understanding and addressing problems that affect sustainability of both water quantity and water quality.

The Program. Hydrologists generally need strong backgrounds in physics, mathematics, chemistry, biology, geology, field methods, and computer methods. Knowledge of biology and chemistry is important for understanding modulators of water quality. Geology is essential for those working in groundwater hydrology. Field methods are necessary for observing and measuring hydrologic phenomena, and computer methods and mathematics are routinely needed for collectively analyzing field data and forecasting future system behavior.

Contemporary hydrologic problems include more efficient use and development of groundwater and surface water resources; pollution of subsurface and surface waters from such sources as urban runoff, leaky underground storage tanks, and agricultural drainage; water quality criteria for drinking water and for fish and aquatic life; acidic precipitation and its

impact on the environment; and the role of water in natural disasters such as flooding, landslides, and land subsidence. Other contemporary concerns include artificial recharge of groundwater, remote sensing for water resources, risk analysis in the operation of surface water reservoirs, and hydrologic prediction under uncertainty. The resolution of these problems demands hydrologic scientists with the comprehensive, multidisciplinary education embodied in this program.

Internships and Career Alternatives. Numerous opportunities for internships exist with state and federal agencies in the Greater Sacramento-Davis area. Career opportunities in hydrologic science are available in private consulting firms, environmental interest groups, and government agencies dealing with water resources, including the U.S. Geological Survey, U.S. Department of Agriculture (Fish and Wildlife, Agricultural Research, Forest Service, and Soil Conservation Service), Environmental Protection Agency, national research laboratories (Lawrence Livermore National Laboratory, Oak Ridge National Laboratory), and California Departments of Water Resources, Water Resources Control board, Regional Water Quality Control Boards, Conservation, Fish and Game, and Toxic Substances. The major is excellent preparation for advance degrees in hydrologic Science and related fields.

B.S. Major Requirements:

UNITS

Written/Oral Expression	0-8
See College requirement	
Breadth/General Education	18-24
Preparatory Subject Matter	72
Biological sciences, Biological Sciences 1A, 1B, 1C	15
Chemistry, Chemistry 2A, 2B, 2C	15
Physics, Physics 9A, 9B, 9C	12
Calculus, Mathematics 21A, 21B, 21C, 21D	16
Linear algebra, Mathematics 22A	3
Differential Equations, Mathematics 22B	3
Physical geology, Geology 50, 50L	5
Applications of computers, Engineering 5 or the equivalent	3
Depth Subject Matter	44-54
Hydrologic Science 100	5
Probability and statistics, Civil and Environmental Engineering 114 or Statistics 130A and 130B	8
Hydrologic Science 103	3
Hydrology	6
Select from Atmospheric Science 133, Civil and Environmental Engineering 142, 142L, Geography 162, Hydrologic Science 141.	
Subsurface hydrology	10-12
Select from Applied Science Engineering 115, Civil and Environmental Engineering 144, Geology 105, 105L, Hydrologic Science 145A, 145B, Soil Science 107, 120.	
Water quality	10-12
Select from Civil and Environmental Engineering 140, 140L, Environmental Studies 110, Hydrologic Science 122, 122L, 134, 136, Soil Science 111.	
Water policy and social awareness	6-8
Select from Agricultural Economics 147, Environmental Studies 160, 161, 179, Geography 160, 161, 170, Geology 134, Hydrologic Science 150.	
Restricted Electives	16-26
Students select an area of concentration in consultation with the Master Adviser, and then obtain prior approval from the Master Adviser for courses used to satisfy the student's area of concentration. Areas of concentration include, but are not limited to, Water Quality, Irrigation and Drainage, Groundwater Hydrology, and Surface Hydrology. Coursework for	

these areas may be taken from Hydrologic Science, Soil Science, Geology, Atmospheric Science, Environmental Toxicology, and Environmental Studies, in addition to advanced courses in Mathematics, Chemistry, and Statistics.

Unrestricted Electives2-20
(Including units earned from 192 and 199 courses.)

Total Units for the Degree180

Minor Program. The Hydrologic Science Section of the Department of Land, Air and Water Resources offers the following minor program. The minor in Hydrologic Science is designed for natural science students who have an interest in water/environmental issues. The interested student should have completed preparatory coursework in calculus (Mathematics 16B), chemistry (Chemistry 2A; Chemistry 2B recommended), physics (Physics 5A), and biology (Biological Sciences 1A).

Minor Program Requirements:

Coursework in the minor provides fundamental skills and knowledge of the hydrologic sciences. The program is sufficiently flexible for students to pursue particular water issues or problems of interest to them.

UNITS

Hydrologic Science20-22

Hydrologic Science 1005

Three Depth Courses: Select one course from each pair below (the alternate course may be chosen as an elective)9

(a) Hydrologic Science 140 or 145

(b) Hydrologic Science 122 or 136

(c) Hydrologic Science 150 or Environmental Studies 161

Two Elective Courses: Select two courses from the following6-8

Hydrologic Science 103, 110, 113, 115, 117, 124, 134, 145B, Soil Science 111, 118, 109, Environmental Studies 150A, 151, Atmospheric Sciences 133.

Courses in Hydrologic Science (HYS)

Questions pertaining to the following courses should be directed to the instructor or to the Resource Sciences Teaching Center, 111A Veihsmeier Hall or 122 Hoagland Hall (916-752-1669).

Lower Division Courses

21. Ecology of Polluted Waters (3) II. Knight
Lecture—3 hours. Prerequisite: Biological Sciences 1A or the equivalent. Causes and nature of various types of pollution and their effects upon aquatic biota. Particular emphasis on biological effects of toxic compounds, inorganic compounds, suspended matter, organic matter, salts and heated water on aquatic life. Not open for credit to students who have completed Water Science 41.

92. Hydrologic Science Internship (1-12) I, II, III.

The Staff
Internship—3-36 hours. Prerequisite: lower division students, consent of instructor. Work experience off and on campus in Hydrologic Science. Internship supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Principles of Hydrologic Science (5) I. Grismer

Lecture—3 hours; laboratory—3 hours; discussion—1 hour. Prerequisite: Chemistry 2B, Physics 5A; Mathematics 16B recommended. Introduction to scientific principles as applied to water and water problems. Topics include hydrology (surface and ground water), flow through porous media, water in soil-plant-atmosphere continuum, water quality, flow through pipes and channels, and representative water-resource problems. Not open for credit to students who have completed Water Science 100. General Education credit: Nature and Environment.

103. Introduction to Fluid Mechanics (3) I. Parlange

Lecture—3 hours. Prerequisite: Physics 5A and Mathematics 16B; course 100 recommended; or consent of instructor. An introductory course in fluid properties, fluid statics, conservation of mass, momentum and energy. Dimensional analysis and boundary layer flow phenomena will also be considered. Not open to students who have completed Water Science 142.

110. Irrigation Principles and Practices (3) III.

Schwankl
Lecture—2 hours; laboratory—3 hours. Prerequisite: Physics 5A; Soil Science 100 recommended. General course for agricultural and engineering students dealing with soil and plant aspects of irrigation and drainage. Soil-water movement and storage, plant responses to irrigation regimes, water use by crops; procedures for determining frequency and depth of irrigation, drainage. Not open for credit to students who have completed Water Science 110.

113. Water Quality, Soil Salinity and Reclamation (4) I. Biggar

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 2B, Soil Science 100; course 100 recommended; or consent of instructor. Water quality parameters, water analysis and salinity control in relation to soil and plant factors; reclamation of soil and disposal of waste water and their effects on receiving waters; localized and regional river basin problems in relation to salinity control and water quality. Not open for credit to students who have completed Water Science 103.

115. Irrigation and Drainage Systems (4) II. Wal-lender, Grismer, Hills

Lecture—4 hours. Prerequisite: Engineering 103A or course 103. Engineering and scientific principles applied to the design of surface, sprinkle and micro irrigation systems and drainage systems within economic, biological, and environmental constraints. Interaction between irrigation and drainage will be emphasized. (Same course as Biological Systems Engineering 145.) Not open to students who have completed Water Science 145.

117. Irrigation Water Management (3) III. Hopmans

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110 or 124, or consent of instructor. Irrigation principles of soil-water and plant-water relations with irrigation system characteristics and other factors into an analytical framework for irrigation water management. Case studies discussed. Not open to students who have completed Water Science 172.

122. Biology of Running Waters (3) I. Knight

Lecture—2 hours; discussion—1 hour. Prerequisite: introductory course in biology and junior standing. The study of lotic aquatic animals and plants in relation to their environment; various factors affecting the distribution of freshwater plants and animals is emphasized in a manner particularly suitable for students of freshwater ecology, soil and water science, and renewable natural resources. Not open for credit to students who have completed Water Science 122.

122L. Biology of Running Waters Laboratory (2) I.

Knight
Laboratory—2 hours (including 2 or 3 weekend field trips). Prerequisite: introductory course in biology or consent of instructor and junior standing; course 122 (concurrently). Course allows interested students to obtain experience in sampling, processing, and synthesizing field data. Field trips will allow students to obtain an understanding of the structure and function of stream ecosystems. Not open for credit to students who have completed Water Science 122L.

124. Plant-Water-Soil Relationships (4) III. Hsiao

Lecture—3 hours; discussion—2 hours. Prerequisite: course 100; Soil Science 100 recommended, and one additional course in botany or plant physiology; or consent of instructor. Principles of plant interactions with soil and water environments and their applications in crop and environmental management. Including nutrient and water uptake and transport; transpiration; soil processes affecting supplies; deficiencies and plant responses. Not open for credit to students who have completed Water Science 104.

134. Aqueous Geochemistry (3) III. Casey

Lecture—3 hours. Prerequisite: Chemistry 2; upper division students. Acid-base equilibria, metal hydrolysis and complexation, mineral solubilities, and rate laws to describe natural water chemistry. Intended to complement course 180: Chemistry of the Hydrosphere.

136. Chemistry of the Hydrosphere (3) III. Tanji

Lecture—3 hours. Prerequisite: Chemistry 2B and an upper division course in soil science, hydrologic science, geology, or limnology; course 134 recommended. Chemical characteristics of water in the hydrologic cycle. Understanding processes and conditions regulating chemical composition of natural waters with particular emphasis on dissolved mineral constituents. Not open for credit to students who have completed Water Science 180.

141. Hydrology (4) II. Puente

Lecture—3 hours; discussion—1 hour. Prerequisite: Physics 5B or 9B, Mathematics 16B or 21B; course 100 recommended. Study of the processes that constitute the hydrologic cycle: precipitation, infiltration, evaporation, transpiration, surface runoff, and groundwater runoff. Not open to students who have completed Water Science 141.

145A. Groundwater Hydrology (3) I. Mariño

Lecture—3 hours. Prerequisite: course 100, 103 or Engineering 103A recommended. Occurrence, distribution, and movement of groundwater. Steady and transient groundwater-flow systems. Aquifer tests. Well construction, operation, and maintenance. Groundwater exploration, quality, and contamination. Not open to students who have completed Water Science 149A.

145B. Groundwater Hydrology (3) II. Fogg

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 145A or Civil and Environmental Engineering 144. Physical and chemical processes in contaminant transport, with emphasis on effects of aquifer complexity. Groundwater geology and chemistry. Fundamentals of groundwater flow and transport modeling. Laboratory includes field pumping test and work with physical and computer models. Not open to students who have completed Water Science 149B and 149L.

150. Water Law and Water Institutions (3) II. The Staff

Lecture—3 hours. Introductory course in water law and institutions. Current problems. Basic principles, with utilization of case-study method. Water rights: kind, acquisition, adjudication, administration and loss. Water organizations and enterprises; kinds, organization, financing, public regulation. Acreage limitation. Water pollution. Not open to students who have completed Water Science 150.

***154. Water and Related Resource Allocation from Economic Principles (2) I.** Grimes

Lecture—2 hours. Prerequisite: Mathematics 16A or consent of instructor. An examination of information needed for analysis and basic procedures of production economics used for an appropriate allocation of water and related resources in agriculture. Cost minimization in production and alternative goals are considered. Offered in alternate years. Not open to students who have completed Water Science 154.

186. Environmental Remote Sensing (3) II. Ustin

Lecture—3 hours. Prerequisite: upper division course in soil science, hydrologic science, environmental studies or the plant sciences. Overview of satellite, airborne, and ground-based remote sensing. Building on properties of EM radiation, isotropic and non-isotropic scattering and absorption, the course examines applications in hydrologic processes, weather and climate, ecology and land use, soils, geology, forestry and agriculture.

192. Hydrologic Science Internship (1-12) I, II, III.

The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in water science. Internship supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) Prerequisite: senior standing. (P/NP grading only.)

Graduate Courses

200. Survey of Hydrologic Sciences (1) I, II, III.

Grismer

Seminar—1 hour; paper. Prerequisite: open to students in the Hydrologic Science program. Seminar course exposes students to the diversity of sciences involved in the program. Students prepare a paper and presentation in their area of research interest. May be repeated twice for credit. (S/U grading only.)

210. Hydrologic Modeling of the Vadose Zone (3)

III. Hopmans

Lecture—2 hours; discussion—1 hour. Prerequisite: Soil Science 107, Mathematics 22B, Programming Language. Principles and modeling of soil water, solute transport, heat and water flow, root water and nutrient uptake. Numerical techniques to incorporate soil heterogeneity. Not open for credit to students who have taken Water Science 200 or Hydrologic Science Graduate Group 210. Offered in alternate years.

212. Evapotranspiration (3) III. Parlange

Lecture—3 hours. Prerequisite: course 103. Review of lower atmosphere properties; introduction to similarity theory; surface roughness parameterization, calculation of energy fluxes, local advection and turbulence measurements will be studied in the field. Not open for credit to students who have completed Water Science 202. Offered in alternate years.

222. The Biology of Streams (5) III. Knight

Discussion—2 hours; seminar—1 hour; laboratory—6 hours (includes field trips). Prerequisite: courses in aquatic entomology, limnology, and phycology. Course will relate various environmental factors to the ecology and productivity of flowing freshwater systems. Emphasis is placed on relationships between stream organisms and their environment by means of integrated field and lecture activities. Offered in alternate years.

235. Advanced Topics in Water and Soil Chemistry (3) III. The Staff

Lecture—3 hours. Prerequisite: a course in physical chemistry and soil chemistry or consent of instructor. Advanced course in water chemistry, emphasizing principles governing interactions of ionic constituents in water with sediment and soils. Topics include electrokinetic properties of clays, membrane phenomena, rate processes and thermodynamic applications to the water soil systems. Not open for credit to students who have completed Water Science 215. Offered in alternate years.

236. Hydrochemical Models (3) II. Tanji

Lecture—2 hours; laboratory—3 hours. Prerequisite: background in applied chemistry and PC and mainframe computers; numerical analyses recommended. Application of mathematical and computer models to chemical problems. Emphasis on process level models (transport, rate and equilibrium) with same exposure to systems level models. Not open for credit to students who have completed Water Science 217.

243. Water Resource Planning and Management (3) I. Mariño

Lecture—3 hours. Prerequisite: course 141 or the equivalent. Applications of deterministic and stochastic mathematical programming techniques to water resource planning, analysis, design and management. Water allocation, capacity expansion, and reservoir operation. Conjunctive use of surface water and groundwater. Water quality management. Irrigation planning and operation models. Not open for credit to students who have completed Water Science 206. (Former course Water Science 206.)

244. Multi-phase Transport in Soils (3) II. Grismer

Lecture—3 hours. Prerequisite: course 103 or Engineering 103A or Civil and Environmental Engineering 141. Aspects of multi-phase flow in soils and their application to infiltration and immiscible displacement problems. Gas phase transport and entrapment during infiltration, and oil-water-gas displacement will be considered. Offered in alternate years. Not open for credit to students who have completed Hydrologic

Science Graduate Group 240 or Biological Systems Engineering 240. (Former course Hydrologic Science Graduate Group 240.)

245. Advanced Soil Physics (3) III. Nielsen

Lecture—3 hours. Prerequisite: Mathematics 22B or consent of instructor; Soil Science 107 and 207 recommended. Theoretical and applied aspects of the simultaneous transport and retention of water, solutes, heat, and gases in unsaturated soils. Emphasis given to current soil physics research topics of general interest in soil, water, and engineering sciences. Offered in alternate years. Not open to students who have completed Water Science 250.

264. Modeling of Hydrologic Processes (3) III.

Puente

Lecture—3 hours. Prerequisite: course 141 or the equivalent and Statistics 102 or the equivalent. Techniques used to model the spatio-temporal structure of rainfall and runoff are introduced. Procedure studied include those based on stochastic point processes, chaos theory, fractal geometry, and fractional noises. Offered in alternate years. (Former course Hydrologic Science Graduate Group 254.)

269. Numerical Modeling of Groundwater Systems (3) III. Fogg

Lecture—3 hours. Prerequisite: course 145A or Civil Engineering 144 and course 145B, Mathematics 22B. Finite difference and finite element techniques in modeling ground-water flow and transport. Fundamentals of constructing and calibrating models with hands-on applications. Methods and limitations of numerical solution of transport equations. Model interpretation and ethics. Not open to students who have completed Hydrologic Science Graduate Group 220. (Former course Hydrologic Science Graduate Group 220.)

***273. Introduction to Geostatistics** (3) I. Fogg

Lecture—3 hours. Prerequisite: Statistics 130A and 130B, or the equivalent. Statistical treatment of spatial data with emphasis on hydrologic problems. Topics include theory of random functions, variogram analysis, Kriging, coKriging, indicator geostatistics, and stochastic simulation of spatial variability. Demonstration and use of interactive geostatistical software included. Not open for credit to students who have completed Hydrologic Science Graduate Group 230. Offered in alternate years.

275. Analysis of Spatial Processes (3) III. Puente

Lecture—3 hours. Prerequisite: Statistics 102 or the equivalent; course 273 or Statistics 273A recommended. Characterization of homogeneous random fields; extremes and spectral parameters; geometry of excursions, local averaging; scale of fluctuation; non-Gaussian and irregular random fields; geostatistical applications. Offered in alternate years. Not open for credit to students who have completed Hydrologic Science Graduate Group 255 or Water Science 255.

290. Seminar (1) I, II, III. The Staff

Seminar—1 hour. Prerequisite: graduate standing. Critical review of hydrologic science problems and issues; oral presentation of research. (S/U grading only.)

291. Seminar in Water-Soil-Plant Relations and Irrigation (1) I, II, III. The Staff

Seminar—1 hour. Prerequisite: graduate standing and background in water-soil-plant relations. Informal presentation on current developments in water-soil-plant relations, plant water use, and irrigation management. Associated discussion analyzes research approaches and techniques and data interpretations. (S/U grading only.)

297. Seminar in Hydrologic Science (3) III. The Staff

Seminar—3 hours. Prerequisite: graduate standing; background in hydrologic science and consent of instructor. Seminar on current area of research in hydrologic sciences. Topic will change from year to year. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Hydrologic Science (A Graduate Group)

Graham E. Fogg, Ph.D., Chairperson of the Group,
Group Office, 113 Veiheymeyer Hall
(916-752-3243/0453)

Faculty. The Group consists of faculty members from the Departments of Chemical Engineering, Civil and Environmental Engineering; Environmental Studies; Geology; and Land, Air and Water Resources.

Graduate Study. The Graduate Group in Hydrologic Science is a unique interdisciplinary program offering M.S. and Ph.D. degrees. Education in the Group is designed to broaden the skills and knowledge of the physical science or engineering student interested in the occurrence, distribution, circulation and properties of water on earth. Because of water's ubiquity and importance to physical, chemical and biological processes, hydrologic science involves the geologic, atmospheric and oceanic sciences, as well as engineering and other applied physical sciences. Basic to the Hydrologic Science program is a core curriculum of courses in fluid dynamics, hydrologic phenomena, hydrobiology, hydrogeochemistry, hydrologic techniques, and hydrologic policy. The program has three degree options including Hydrobiology, Hydrology (Hydrogeology) and Hydrogeochemistry.

Preparation. Applicants to the program are expected to have completed or to be in the process of completing an undergraduate degree in some aspect of the physical sciences, mathematics, or engineering. Undergraduate study must include one year of calculus, one year of physics with calculus, and one year of chemistry. Additional courses in applied statistics, computer programming, and geology are recommended.

Specialization. Each student will pursue an individual program of advanced study under the direction of a group of faculty members with similar interests but diverse backgrounds. Coursework in addition to the above is typically taken in the most appropriate departments.

Graduate Adviser. G.E. Fogg and M.B. Parlange (Land, Air and Water Resources).

Immunology (A Graduate Group)

M. Eric Gershwin, M.D., Chairperson of the Group -
Group Office, 1151 Meyer Hall (916-752-2512)

Faculty. The faculty includes members from several colleges and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Immunology is a multi-disciplinary group offering programs of study leading to the M.S. and Ph.D. degrees in various aspects of immunology. Possible areas of specialization include molecular biology, immunochimistry, immunogenetics, cellular immunology, clinical immunology, and tumor and developmental immunology.

Preparation. Applicants for candidacy to these programs should have completed undergraduate preparation in general biology, zoology or botany, general bacteriology or microbiology, general genetics, mathematics, general physics, chemistry, and biochemistry.

For work leading to the Ph.D. degree, the requirements include cell biology, chemical immunology, cellular immunology, immunohematology, and advanced immunology. In addition to these general requirements more specialized preparation in at least one of the following is required: (a) microbiological specialties (bacteriology, virology, parasitology, medical microbiology); (b) zoological specialties (cell biology, endocrinology, embryology, protozoology, histology, cytology, physiology); (c) medical specialties (pathology, anatomy, pharmacology, clinical pathology, reproduction, hematology, epidemiology); (d) biochemistry/biophysics specialties (biologically active molecules, control mechanisms); (e) genetic specialties (developmental genetics, population genetics, cytogenetics, molecular genetics).

Graduate Adviser. Contact the Group Office.

Courses in Immunology (IMM)

Additional courses are available and listed under the individual sponsoring departments. Contact the group office for information.

Graduate Courses

292. Immunotoxicology Seminar (2) Il. Golub Seminar—2 hours. Prerequisite: graduate standing in Pharmacology/Toxicology, Immunology, Physiology, or Biochemistry. Seminar presentations dealing with principles of xenobiotic effects on immune system functions and specific examples of drugs and environmental chemicals exerting toxic effects on the immune system. Offered in alternate years. (S/U grading only.)

295. Cytokines: An Expanding Class of Cell Regulatory Agents (2) Il. Benton, Erickson Lecture/discussion—2 hours. Prerequisite: undergraduate courses in immunology, cell biology and biochemistry. Lectures, discussion and presentations which examine the role of cytokines in immunity, inflammation tissue injury and disease. Current knowledge of their molecular structures specific receptors, antagonists and signalling mechanisms will be discussed.

296. Advanced topics in Immunology (3) Il. Cheung Seminar—3 hours. Prerequisite: graduate standing. Presentation, discussion and analysis of research topics in immunology, with emphasis on investigative bench research. (S/U grading only.)

Independent Study Program

Information:

Chairperson
Committee on Courses of Instruction
c/o Academic Senate Office (916-752-2231)

The Independent Study Program provides an opportunity for upper division students to design and pursue a full quarter (12-15 units) of individual study in an area of special interest.

A program qualifying as Independent Study will consist of one or more courses in the 190-199 series. While the theme of such a program may be reasonably broad, a recognizable common thread should unite all the academic work you undertake during an independent study quarter. Regularly offered formal courses will only be acceptable as a part of such a program if they clearly fit its theme and contribute something essential toward the realization of its objectives. The program is not to be considered a way to take more variable-unit courses than normally permitted.

The procedure for enrolling in an Independent Study Program is as follows:

1. develop, in general terms, a plan of study;
2. locate a faculty sponsor or panel of sponsors, and with their help and approval develop a detailed plan;

3. complete a project proposal form (obtained from the Academic Senate Office) and submit it to the Academic Senate Committee on Courses of Instruction.

The deadline for applications is the end of the second week of the term prior to the term in which the project is to be undertaken. (See the Academic Calendar at the front of the catalog for specific dates.)

You must report the completion or termination of the project to the Committee on Courses of Instruction.

Individual Major

(Colleges of Agricultural and Environmental Sciences and Letters and Science)

The Major Program

The Individual Major, an integrated program composed of courses from two or more disciplines, is designed by the student and is subject to approval by faculty advisers and appropriate college committees. This major enables a student to pursue a specific interest which cannot be accommodated within the framework of an existing major. It must clearly and specifically meet the student's educational goals as well as meet university and college academic standards.

Proposals for individual majors should be submitted before the fourth quarter prior to graduation. Specific requirements for each college are shown below. Application forms are available in program offices.

College of Agricultural and Environmental Sciences

Academic Advising Center, 228 Mrak Hall (916-752-0610)

B.S. Major Requirements:

UNITS

English Composition requirement0-8
See College requirement

Preparatory Subject Matter(variable)
Lower division courses basic to the program or needed to satisfy prerequisites for upper division requirements.

Breadth/General Education6-24
Satisfaction of General Education requirement.

Depth Subject Matter45-54
Upper division coursework must include:

- a) related coursework from two or more campus departments focused on a single educational theme, and
- b) at least 30 units must be taken from courses provided by the College of Agricultural and Environmental Sciences.

Note: the completed proposal should be submitted to the Individual Major Committee at least four quarters before graduation; otherwise graduation may be delayed.

Unrestricted Electives(variable)

Total Units for the Degree180

Master Adviser. G.C. Martin (*Pomology*). The individual major proposal must be developed in consultation with the Academic Advising Center and two or more faculty members prior to final review by the Individual Major Committee for the College.

Incoming transfer students applying for an Individual Major will be admitted into the Exploratory Program.

College of Letters and Science

Program Office, 150 Mrak Hall (Dean's Office), (916-752-0392)

Committee in Charge

David Barsky, Ph.D. Chairperson (*Mathematics*)
Jay Helms, Ph.D., (*Economics*)
Steven Lapointe, Ph.D., (*Linguistics*)
Arnold Sillman, Ph.D. (*Neurobiology, Physiology and Behavior*)
Marian Ury, Ph.D. (*Comparative Literature*)
Diane Wolf, Ph.D. (*Sociology*)

A.B. and B.S. Major Requirements:

UNITS

Preparatory Subject Matter(variable)
Lower division courses basic to the program or needed to satisfy prerequisites for upper division requirements.

Depth Subject Matter45-54

Upper division units must include:

- a. interrelated and complementary courses from two or more departments which provide a unified pattern and focus;
- b. at least 30 units from Letters and Science teaching departments or programs;
- c. no more than 10 units in courses numbered 194H, 198 and 199;
- d. for the A.B. degree, a maximum of 80 units toward the major; for the B.S. degree, a maximum of 110 units toward the major.

Total Units for Degree180

Student Proposal. A student submits to the Dean's Office a major proposal and an essay, discussing educational purposes, personal and/or professional objectives, along with faculty letters of recommendation. After initial review, the Faculty Committee on Individual Majors evaluates the proposal and provides final action.

Major Advisers (selected by student). *Principal Adviser:* a faculty member in a teaching department or program in the College of Letters and Science in major field of emphasis. *Secondary Adviser:* a faculty member from secondary area of interest.

Honors Program. Toward the end of the junior year, students potentially eligible for high or highest honors at graduation (see College section), may petition the Individual Majors Committee for tentative acceptance into an honors program.

Final admission will depend upon the Committee's approval of a senior thesis prospectus that has been agreed upon by the student and faculty adviser. The prospectus must be presented to the Committee during the first quarter of the senior year. Graduation with high or highest honors will be conditional upon both the maintenance of the required grade-point average and the completion of the senior thesis project. Students who anticipate doing a senior honors thesis should allow up to 3 units of independent study in the program during each of the last quarters in the senior year as course options.

Integrated Studies

(College of Letters and Science)

Nora A. McGuinness, Ph.D., Program Director
Program Office, 816 Sproul Hall (916-752-3377)

Committee in Charge

Richard T. Curley, Ph.D. (*Anthropology*)
Kurt Kreith, Ph.D. (*Mathematics*)
Nora A. McGuinness, Ph.D. (*Integrated Studies*)
Jay Mechling, Ph.D. (*American Studies*), Chairperson
Kenneth L. Verosub, Ph.D., (*Geology*)

Faculty

Richard T. Curley, Ph.D., Lecturer (*Anthropology*)
Dennis Dingemans, Ph.D., Associate Professor (*Geography*)

Gail Goodman, Professor (*Psychology*)
 Georges Halpern, Adjunct Professor (*Internal Medicine*)
 Kurt Kreith, Ph.D., Professor (*Mathematics*)
 Jerold A. Last, Ph.D., Professor (*Internal Medicine, Biological Chemistry*)
 Douglas McCole, Ph.D., Professor (*Physics*)
 Nora A. McGuinness, Ph.D., Academic Coordinator (*Integrated Studies*)
 Jarue S. Manning, Professor (*Microbiology*)
 Jay Mechling, Ph.D., Professor (*American Studies*)
 Kenneth L. Verosub, Ph.D. Professor (*Geology*)
 Daniel L. Wick, Ph.D., Lecturer (*Integrated Studies*)

The Program of Study

Integrated Studies is an invitational freshman Honors residential program, offering specially designed courses in humanities, natural sciences, and social sciences. The program encourages cross-disciplinary interests in its faculty and students. It values close contact between student and professor both in the classroom and in the residence hall. Integrated Studies courses fulfill college breadth requirements and lower division General Education requirements. Enrollments are limited. (In 1994-95, 60 students will be admitted to the program. Class sizes are limited to 25.)

Students enroll in at least three Integrated Studies courses during the year. **Students not admitted to the Program may not register for Integrated Studies courses.**

Courses in Integrated Studies (IST)

Lower Division Courses

- 1A. Nature and the Environment: Physics (4) III.** McCole
 Lecture—2 hours; discussion—2 hours. Introductory course on the history, philosophy and methodology of physics from 600 B.C. to the present day. Changes in ideas about the physical universe explored. Problem solving not emphasized. General Education credit: Nature and Environment.
- *1B. Nature and the Environment: Origins of the Universe (4) I.** The Staff
 Lecture—3 hours; discussion—1 hour. Knowledge of the origins of the universe, of matter, of galaxies, stars, and planets, and of the earth and the variety of life forms that have evolved on this planet. General Education credit: Nature and Environment.
- *1C. Nature and the Environment: Molecules to Humans (4) II.** The Staff
 Lecture—3 hours; discussion—1 hour. Prerequisite: high school chemistry. Intended for liberal arts students. Integrates the principles of chemistry, biochemistry, genetics and molecular biology. Students are expected to achieve a fair scientific literacy in all of the subjects.
- 2A. Civilization and Culture: Mathematics and Civilization (4) I.** Kreith
 Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra and geometry. Topics from arithmetic, geometry, algebra and probability presented in historical context which is designed to convey an appreciation of the role that mathematics has played in shaping our world and civilization.
- *2B. Civilization and Culture: Theology (4) I.** Robertson
 Discussion—4 hours. Major issues in theology, including the existence and nature of God, the nature and destiny of the human species, free will, and morality from both a western and eastern perspective. General Education credit: Civilization and Culture.
- *2C. Civilization and Culture: Origins of Western Civilization (4) III.** Roller
 Lecture—3 hours; discussion—1 hour. Civilizations of the ancient Near East and Greece: the problem of divine-human relations, problems of law and justice, and development of science and of logical thought. Readings include selections from Near Eastern texts and from Greek literature.

- *2D. Civilization and Culture: Literature and Writing (4) I.** McGuinness
 Lecture—3 hours; small-group writing workshop. Prerequisite: completion of Subject A requirement. Exposure to basic methods of literary analysis in drama, fiction and poetry and concepts that guide literary scholars in making critical judgments. Formal writing training. General Education credit: Civilization and Culture.
- *2E. Civilization and Culture: Playing Shakespeare (4) III.** Schroeder
 Lecture—3 hours; laboratory—2 hours. Prerequisite: completion of Subject A requirement. Shakespeare as a theatre professional: producer, actor, director. His use and development of Elizabethan theatre acting space. Objective analysis of how Shakespeare's text actually works on stage. Scene exercises to illustrate effective playing of the text.
- 3A. Contemporary Societies: History in Our Time (4) II.** Wick
 Lecture—3 hours; discussion—1 hour. Major political, economic, historical, and ideological changes in the global community since the 1970s. General Education credit: Contemporary Societies.
- *3B. Society Through Literature: Modern Europe (4) I.** Wick
 Lecture—3 hours; discussion—1 hour. Readings and discussion concerning European experience as related to the Russian revolution, two world wars, the rise of Fascism, Nazi holocaust, and the decline of Europe as the center of world politics. General Education credit: Civilization and Culture.
- *3C. Society Through Literature: Modern China (4) II.** Gibbs
 Lecture—3 hours; discussion—1 hour. China's twentieth-century experience: national humiliation, invasion, isolation, oppression, and the overthrow of ancient values, as reflected in short stories, novels, poetry, and film. General Education credit: Civilization and Culture.
- *3D. Contemporary Societies: Speech, Privacy, and Conscience (4) II.** The Staff
 Discussion—4 hours. Analysis of the constitutional rights of speech, privacy, and conscience as limits on majoritarian decision-making. Specific topics to be covered include pornography, "hate" speech, broadcast codes, book censorship, sexual and associational privacy, abortion, and euthanasia. General Education credit: Contemporary Societies.
- *3E. Contemporary Societies: Sociology (4) III.** Hackett
 Lecture—2 hours; discussion—2 hours. Introduction to modern sociological research and theory utilizing material drawn from three topical areas: the development of gender identities, the social production of scientific and other forms of knowledge, and the social basis of religious belief. General Education credit: Contemporary Societies.
- *8. Colloquium (1) I, II, III.** The Staff (N. McGuinness in charge)
 Discussion—1 hour. Lectures, films, and readings on the interrelation between the arts and sciences. May be repeated for credit. (P/NP grading only.)
- 8A. Special Topics in Natural Science and Mathematics (4) II, III.** The Staff
 Lecture—3 hours; discussion—1 hour. Group study of a special topic in natural sciences and mathematics. Course varies with topic offered. Limited enrollment. May be repeated for credit. General Education credit: Nature and Environment.
- 8B. Special Topics in Humanities (4) I, II.** The Staff
 Lecture—3 hours; discussion—1 hour. Group study of a special topic in humanities. Course varies with topic offered. Limited enrollment. May be repeated for credit. General Education credit: Civilization and Culture.
- 8C. Special Topics in the Social Sciences (4) I, II, III.** The Staff
 Lecture—3 hours; discussion—1 hour. Group study of a special topic in social sciences. Course varies with topic offered. Limited enrollment. May be

repeated for credit. General Education credit: Contemporary Societies.

9. Seminar (1) I, II, III. The Staff (N. McGuinness in charge)
 Lecture—1 hour. Lectures, films, and readings on the themes for the year. May be repeated for credit. (P/NP grading only.)

Internal Medicine

See Medicine, School of

International Agricultural Development

(College of Agricultural and Environmental Sciences)

The Major Program

The goal of international agricultural development is to improve food production, nutrition, marketing, and health in less technically advanced countries. Students in this major are trained in technical areas of agriculture that can be applied to the problems of world hunger and health.

The Program. International agricultural development majors may select their areas of technical specialization from any of the agricultural and environmental sciences, for example, agricultural economics, agricultural engineering, animal science, community development, food science, plant science, or resource science. Students interested in international work also need to develop the qualities necessary for effective performance in developing areas of the world. Courses in social sciences, humanities, and economics work toward this end by providing an understanding of the broad cultural, social, and economic environments in which agriculture operates in countries outside of the United States.

Career Alternatives. The study of international agricultural development prepares a student for a variety of careers. Some students choose service through the Peace Corps. Others seek employment in international trade, while others choose to work for a governmental or private agency in a foreign nation. Religious groups and organizations also employ university-trained individuals for agricultural work in conjunction with missions and other types of human service work overseas. The major is also preparation for further graduate work in agricultural development.

B.S. Major Requirements:

(For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	42-48
(Choose either Social Sciences or Natural Science core)	
Social Sciences core	
Chemistry (Chemistry 10).....	4
Science (Biological Sciences 10, Plant Science 2, Animal Science 1, Nutrition 10, Soil Science 10)	15
Social sciences (Applied Behavioral Sciences 1, Anthropology 2, Political Science 2, Sociology 1, History 4C)	16

*Course not offered this academic year.

Statistics (Agricultural Systems and Environment 120 or Statistics 13 or Sociology 46).....3-4

Natural Science core

Biological sciences (Animal Science 2, Biological Sciences 1A, 1B, 1C, Plant Science 2).....15
Chemistry (Chemistry 2A, 2B, 8A, 8B).....16
Mathematics (Mathematics 16A or 21A) ...3-4
Physics (Physics 6A).....4
Statistics (Agricultural Systems and Environment 120 or Computer Science Engineering 10).....3

Breadth/General Education6-24

Satisfaction of General Education requirement

Depth Subject Matter39

International Agricultural Development 10, 110.....9
International agricultural development (International Agricultural Development 101, 102, 103, 141, 190, 191, 195, 198).....12
Economics and social sciences: Economics 1A-1B and two upper division courses relevant to development (Agricultural Economics 100A, 100B, 106, 113 or 136, 115A-115B, 140, 145, 147, 150, 176; Economics 100, 100M, 110A, 115A, 115B, 118; Anthropology 126, 131, 135; Applied Behavioral Science 153; Political Science 126, 146, 148A-148B; Sociology 144, 145).....18

Primary Field of Specialization60

Natural Sciences or Social Sciences:

Courses chosen by student, with an adviser in that specialization, to include additional preparation required for a particular specialization, depth subject matter, and supporting disciplines.

Natural Sciences: Student should include some course work in social sciences appropriate to the geographic area of personal interest (e.g., anthropology, geography, history, or political science area studies courses).

Unrestricted Electives1-34

Students not possessing a reading/speaking ability in a foreign language will be encouraged to use these electives for language study or to attend an intensive language school.

Total Units for the Degree180

Specialization Advisers

A listing of faculty in the various areas of specialization and with interests in International Agricultural Development is available from the Major Adviser.

Major Adviser. S. B. Brush (*Applied Behavioral Sciences*).

Minor Program Requirements:

UNITS

International Agricultural Development.....20

International Agricultural Development 10, 101, 102, 11016
Minimum of four units chosen from International Agricultural Development 103, 141, 190, 195, Economics 115A-115B, Vegetable Crops 150, Agronomy 100, 100L, 111.....4

Minor Adviser. S. B. Brush (1361 Hart Hall).

Graduate Study. A program of study and research leading to the M.S. degree is available in International Agricultural Development. Detailed information regarding graduate study may be obtained by writing to the Coordinator of Graduate Recruitment (I.A.D.), Graduate Studies, UC Davis.

Graduate Advisers. S.B. Brush, (*Applied Behavioral Sciences*); D.J. Boyd (*Anthropology*); K.G. Cassman (*Agronomy and Range Science*); L.S. Jarvis (*Agricultural Economics*).

Related Courses. See Agricultural Economics 148, 215C; Agronomy 111; Animal Science 160; Anthro-

pology 221; Economics 115A-115B, 118, 215A-215B-215C; Geography 142; Nutrition 20; Sociology 144; Vegetable Crops 150.

Courses in International Agricultural Development (IAD)

Questions pertaining to the following courses should be directed to the instructor or to the Department of Applied Behavioral Sciences, Advising Center in 1303 Hart Hall (916-752-2244).

Lower Division Courses

10. Introduction to International Agricultural Development (4) II. Brush

Lecture—3 hours; discussion—1 hour. Theories, practices and institutions relating to agricultural development; the interaction of changing social, cultural and economic organization through successive stages of economic development; impact of new agricultural technology on underdeveloped regions. General Education credit: Contemporary Societies.

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: consent of instructor. Supervised internship, off and on campus, in community and institutional settings. (P/NP grading only.)

Upper Division Courses

101. Tropical Crop Agriculture (4) II. The Staff

Lecture—4 hours. Prerequisite: Plant Science 2 or Biological Sciences 1C, and Soil Science 100 or Agronomy 100. Environment and management factors affecting plant agriculture and farming systems in the tropics. Crops are considered in relation to shifting cultivation, rice-based cropping systems, annual cropping, polycropping and monoculture of perennial species.

102. Limited Resource Animal Agriculture (4) III. Brown (Animal Sciences)

Lecture—3 hours; laboratory—3 hours; one all-day Saturday field trip required. Prerequisite: Animal Science 2. Environmentally and economically sound methods are presented to meet objectives of limited resource animal agriculture system. Range systems, small farms, Third World systems and suburban enterprises are considered. (Same course as Animal Sciences 102.)

*103. Social Change and Agricultural Development (4) III. The Staff

Lecture/discussion—4 hours. Prerequisite: introductory social science course (Anthropology, Sociology, Economics, International Agricultural Development). How social and cultural factors influence technological change in agriculture; theories of diffusion of innovations; social impact analysis and technology assessment. Offered in alternate years.

110. Agricultural Production Economics (4) I. The Staff

Lecture—4 hours. Prerequisite: upper division status and an introductory course in microeconomics (Economics 1A). Economic analysis of agricultural production in low income countries, from field-level data collection to national food policy. Emphasis is given to construction and use of farm models in project evaluation.

111. Agricultural Marketing Systems (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division status and an introductory course in microeconomics recommended (Economics 1A). Economic analysis of agricultural marketing systems in low income countries, including the functions of transportation, storage, packaging, handling, grading and standardization, processing, and market news. Emphasis is given to evaluation of interventions in marketing systems to speed economic development.

141. Technology for Agriculture in Developing Regions (3) I. Chancellor (Agricultural Engineering)

Lecture—2 hours; laboratory/discussion—2 hours. Prerequisite: Physics 1A; upper division standing. Equipment used in tropical agriculture. Man-, animal-, and engine-powered devices. Energy requirements,

size-scale, costs, support infrastructure development, and productivity potentials. (Same course as Applied Biological Systems Technology 141.)

190. Proseminar in International Agricultural Development (1) I, II, III. The Staff

Seminar—1 hour. Presentation and discussion of current topics in international agricultural development by visiting lecturers, staff and students. May be repeated for credit. (P/NP grading only.)

*191. Topics in International Agricultural Development (3) I, II, III. The Staff

Lecture/discussion—3 hours. Prerequisite: consent of instructor. Selected topics dealing with current issues in agricultural development in lesser developed nations—variable content. May be repeated for credit.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: consent of instructor. Supervised internship, off and on campus, in community and institutional settings. (P/NP grading only.)

195. Field Study in Agricultural Development (3) III. The Staff

Lecture—2 hours total; seminar—8 hours total; field work—overnight trips to sites in California (four two-day visits) or Mexico (one eight-day visit). Students will incur travel expenses. Observation of agricultural development strategies and impact on rural communities. Discussion with farmers, workers and organizational staff members. Study of farm commodities, institutions and experiences in dealing with agricultural development problems. International influence on United States agriculture. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

200. Analysis and Determinants of Cropping Systems (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 101, Agricultural Science and Management 150 (or comparable statistics course). Cropping systems as a function of farmer objectives, resource availability, environment, and yield potential; interactions among management strategies, resource use efficiency, and the agroecosystem; stability, diversity, and sustainability of cropping systems.

201. The Economics of Small Farms and Farming Systems (4) II. Jarvis

Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics 100A. Economic perspective on small farm development. Establishes a basis for predicting farmers' responses to changes in the economic environment, and for proposing government policies to increase small farm production and improve farmer and national welfare.

202. Social Systems and Agricultural Development (4) I. Orlove (Design), Brush (Applied Behavioral Sciences)

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division course work in economic development, cultural anthropology, sociology, or political science (especially comparative politics or public administration), or consent of instructor. Social and cultural factors in agricultural and rural development; adaptation of rural people to development process; agrarian movements and revolution; evaluation of theories of rural development; application of social analysis to design and implementation of rural and agricultural policies and programs.

203. Management Systems for Agricultural Development (4) II. Wolf

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200 or 201 preferably, or 202; or consent of instructor. Contexts of agricultural and rural development; strategies for program implementation; planning, staffing, and financing agricultural development; processes and structures of implementation; delega-

tion, decentralization, devolution, deconcentration, and dispersal.

***220. Food and Nutrition Strategies in Developing Countries** (4) II. Jarvis

Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics 100A. Identifies important topical problems in food and nutrition policy, develops theoretical frameworks suitable for their analysis, examines the empirical information relevant to the problems and, using theory data, draws appropriate policy implications. Offered in alternate years.

290. Seminar in International Agricultural Development (1-2) I, II, III. The Staff

Seminar—1-2 hours. Prerequisite: consent of instructor. Discussion and critical evaluation of advanced topics and issues in international agricultural development. (S/U grading only.)

***291. Topics in International Agricultural Development** (1-3) I, II, III. The Staff

Lecture/discussion—1-3 hours. Prerequisite: consent of instructor. Selected topics dealing with current issues in agricultural development in lesser developed nations. Variable content. May be repeated once for credit.

292. Graduate Internship (1-12) I, II, III. The Staff
Internship—3-36 hours. Prerequisite: participation in H. Humphrey Fellow Program or consent of instructor. Individually designed supervised internship, off or on campus, in community, business or institutional setting. Developed with advice of faculty mentor and Humphrey Coordinator. (S/U grading only.)

298. Directed Group Study (1-5) I, II, III. The Staff (Graduate Group Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Graduate Group Chairperson in charge)
(S/U grading only.)

International Agricultural Development (A Graduate Group)

Janet D. Momsen, Ph.D., Chairperson of the Group
Group Office, 1303 Hart Hall (916-752-1926)

Faculty. The Group includes faculty from the Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science, and the School of Veterinary Medicine.

Graduate Study. The International Agricultural Development M.S. degree program prepares U.S. and foreign students for careers in agricultural and rural development around the world. Many of its faculty members have had international experience in development.

The philosophy guiding the program is that graduates must have strong preparation in a specific field within the agricultural and social sciences. Thirty different specializations are offered. In addition, to apply their specializations, graduates should be perceptive and understanding of people in developing nations, and have a comprehension of how technological, social, economic, and political variables affect the development process. They should have insight into individual and group motivations and be able to discern ways to initiate changes.

The program provides a multidisciplinary education designed to recognize these needs. It guides students to the knowledge, skills, and abilities needed to stimulate, assist, or manage agricultural development and enhance rural life in developing countries. Students are prepared to accomplish technological and biological improvement in agricultural methods and to encourage social innovations where appropriate.

Graduate Adviser. Contact the Group Office.

International Relations

(College of Letters and Science)

_____, Program Director

Program Office, Social Sciences and Humanities
Building (916-752-3063)

Committee in Charge

Michael R. Caputo, Ph.D. (*Agricultural Economics*)

Dennis J. Dingemans, Ph.D. (*Geography*)

Yuri Druzhnikov, Ph.D. (*Russian*)

Emily O. Goldman, Ph.D. (*Political Science*)

Julie Nelson, Ph.D. (*Economics*)

Donald S. Rothchild, Ph.D. (*Political Science*)

Janet S. Smith, Ph.D. (*Anthropology*)

Clarence E. Walker, Ph.D. (*History*)

Wing T. Woo, Ph.D. (*Economics*)

The Major Program

Problems of security, human rights, energy and mineral resources, and the environment are increasingly confronted at a global rather than a national level. With its theoretical models and real-world application, the study of international relations has become an exciting and highly relevant interdisciplinary major.

The Program. Graduation with a major in international relations requires completion of introductory courses in political science, economics, geography, and history. Upper division work is composed of a core of four courses in economics and political science required of all majors, and an additional set of eight courses chosen from one of four clusters which encompass major topical areas in combination with regional emphases: I. World Trade and Development, II. International Relations of the Third World, III. Global Resources and Environment, IV. World Politics. The major also requires fluency in English and a working knowledge (approximately 24 to 30 units of course credits or equivalent fluency) of one other modern language.

Programs, Internships, and Career Alternatives.

One program of special interest to international relations majors is the Education Abroad Program, which provides insights into the life and culture of other countries. At UCD, the internship program assists students in obtaining legislative, legal, and business internships. In addition, the UC Davis Washington Center arranges internships in Washington, D.C. International relations graduates are prepared for employment in governmental agencies abroad (such as the Foreign Service), with state agencies, international or non-governmental organizations (such as the United Nations), foundations, and companies having interests in international business, trade, or finance. The stringent language requirement of the major program enhances career prospects in jobs which demand knowledge of the language and culture of other countries.

Preparatory requirements. Before declaring a major in International Relations, students must complete the following courses with a combined grade point average of at least 2.50 (all courses must be taken for a letter grade):

Economics 1A, 1B.....	10 units
Geography 10.....	3 units
History 4C.....	4 units
Political Science 3.....	3 units

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24-55
Economics 1A, 1B.....	10
Political Science 3.....	4
Geography 10.....	3
History 4C.....	4
One course selected from Anthropology 2, Environmental Studies 30, Geography 2, History 4B, 9A, 9B, 10, 15, 17C, International Agricultural Development 10, Political Science 1, 2.....	3-4

Approximately 24 to 30 units (or the equivalent) in one modern foreign language (see adviser for details).....0-30
Recommended: one course in statistics (e.g., Sociology 46A, 46B, Statistics 13)

Depth Subject Matter.....48-50

Economics 115A or 115B.....4
Economics 160A-160B (Cluster I) or 162 (Clusters II, III, IV).....4-8
(Cluster I students: note prerequisites for courses 160A-160B.)

Political Science 123.....4
Political Science 130.....4

Cluster emphasis.....32
Choose one from the four clusters shown below. Courses must be in addition to those applied toward requirements above.

Total Units for the Major.....72-105

Course List for Cluster Emphasis

Cluster I: World Trade and Development
(Heavy economic emphasis; suitable particularly for students who seek careers in international business or international organizations)

Economics 100 or 104
Economics 101 or 105
Economics 160A-160B
Economics 160A fulfills one core requirement; Economics 160B fulfills a cluster requirement.

One course to be selected from:
Economics 115A or 115B (whichever course is not used to fulfill the core requirement above)

Two courses to be selected from:
Anthropology 122, 126, 131, 135
Geography 141, 142
Political Science 124, 178
Sociology 139, 141, 144, 145A

Two regional courses from Group A (History)

Cluster II: International Relations of the Third World
(Focuses on problems of development of the Third World in recent times)

One course to be selected from each of four subjects:
Anthropology 123A, 124, 126, 127, 131, 135
Sociology 118, 139, 141, 145A
Political Science 124, 126, 127, 128, 178
Economics 110B, 115A or 115B
(whichever course is not used to fulfill the core requirement above), 116

Four regional courses *focused on Third World*:
Select two courses from Group A (History)
Select two courses from Group B (Anthropology, Economics, Geography, Political Science, and Sociology)

Cluster III: Global Resources and Environment
(Designed to familiarize students with major patterns of resource distribution in the world and the role resources play in international affairs)

Three courses to be selected from:
Agricultural Economics 147, 176
Economics 123
Environmental Studies 100, 101
Geography 160
Political Science 107
Environmental and Resource Sciences 100

Two additional courses to be selected from two of the following groups:
Energy—Agricultural Economics 175, Geology 130, Political Science 171
Food Resources—Geography 142, 175, Sociology 144
Population—Sociology 170
Rural Development—Anthropology 126, 131, 133, 135
Urbanization—Anthropology 127, Geography 156, Sociology 143A, 145A

*Course not offered this academic year.

Water Resources—Geography 162, Geology 116

Three regional courses:

Select two courses from Group A (History)

Select one course from Group B (Anthropology, Economics, Geography, Political Science, and Sociology)

Cluster IV: World Politics

(Examines political relationships in international relations. The focus is on national governments and their activities in the global political system)

One course to be selected from: Political Science 120, 121

Two courses to be selected from:

Economics 116

History 145, 146A, 146B, 147A, 147C

Political Science 112, 128, 132, 140, 177, 178

Sociology 119, 157, 165A

One course to be selected from:

Anthropology 123A

Geography 143

Philosophy 118

Sociology 118

Four regional courses:

Select two courses from Group A (History)

Select two courses from Group B

(Anthropology, Economics, Geography, Political Science, and Sociology)

Regional Courses—Group A

History 115A, 115B, 115C, 137C, 141, 143, 144, 145, 146A, 146B, 151D, 161B, 163B, 165, 166B, 168, 174B, 174C, 190B, 190C, 194C, 195, 196B (History 102 with advance approval by faculty adviser; History 145, 146A, and 146B may be offered only once toward the major)

Regional Courses—Group B

Anthropology 131, 140A, 140B, 142, 144, 147, 148B, 149B

Economics 170, 171, 172, 173

Geography 122A, 122B, 123, 124, 125A, 125B, 126, 127

International Culture courses:

French 107, Russian 130, 131

Political Science 131, 133, 134, 136, 137, 138, 141, 143, 146, 148A, 148B, 148C, 149, (Political Science 129, 139, 179 with advance approval by faculty adviser)

Sociology 147

Major Adviser. M. Nincic (*Political Science*).

Courses in International Relations (IRE)

Lower Division Courses

98. Directed Group Study (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

190. Topics in International Relations (4) I, II, III.

Lecture/discussion—4 hours. Prerequisite: consent of instructor. Selected topics in international relations. Variable content. May be repeated for credit when a different topic is studied.

192. International Relations Internship (1-12) I, II, III.

The Staff (Committee Chairperson in charge) Internship—3-36 hours (to be arranged). Prerequisite: upper division standing and consent of instructor. Work experience in international relations, with term paper summarizing the practical experience of the student. (P/NP grading only.)

194HA-194HB. Special Study for Honors Students (4-4) II-III. Nincic and staff

Seminar—2 hours; term paper. Prerequisite: open only to majors of senior standing who qualify for honors program. Directed reading, research, and writing on topics selected by students and instructor culminating in preparation of a senior honors thesis under direction of a faculty adviser. (Deferred grading only, pending completion of course sequence.)

198. Directed Group Study (1-5) I, II, III.

Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III

Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

Internship

See Internship Program below; also UC Davis Washington Center

Internship Program

Lawrence B. Coleman, Ph.D., Director

Jeanne B. Shelby, Associate Director

The Internship and Career Center 2nd Floor, South Hall (916-752-2855)

Program Areas

Agricultural and Environmental Sciences

Joe J. Stasulat, Program Manager

Education and Graduate Placement

Kathi Shull, Coordinator

Engineering and Physical Sciences

Linda R. Hughes, Program Manager

Health and Biological Sciences

Linda R. Hughes, Program Manager

Liberal Arts

Lawrence B. Coleman, Program Manager

Internship Experience

The Internship and Career Center facilitates a campuswide internship program. All internships, both credit and non-credit, can be taken for *Transcript Notation* with completion of required evaluation reports. The notation briefly describes the nature and location of the internship experience. Questions pertaining to academic credit and Transcript Notation may be directed to The Internship and Career Center.

Course Credit. Internship courses (numbered 92 and 192) are available for credit on a variable-unit and Passed/Not Passed grading basis. A maximum of 12 units of 92 and/or 192 courses may be counted toward the 180-unit minimum needed for graduation. To qualify for the 192 course, students must have acquired 84 units of credit. All credited internships require approval and sponsorship by a faculty member from an appropriate discipline. Arrangements may be made through the department of the sponsoring faculty member and facilitated by The Internship and Career Center Staff.

Italian

(College of Letters and Science)

JoAnn Cannon, Ph.D., Program Director

Department Office (French and Italian), 515 Sproul Hall (916-752-0830)

Faculty

JoAnn Cannon, Ph.D., Professor

Dennis J. Dutschke, Ph.D., Professor

Gustavo Foscarini, M.A., Lecturer

Juliana Schiesari, Ph.D., Associate Professor

The Major and Minor Programs

The major in Italian is intended to provide a solid language background which will enable the student to develop an appreciation for Italian language and culture.

The Program. The Italian program is small and geared to the individual needs of the student. The use of Italian is stressed on all levels and a knowledge of the language is required for literature courses which are taught only in Italian. The Italian program actively participates in the Education Abroad Program, the International Internships Program, and the Summer Sessions International (Naples), all of which offer opportunities for travel and study in Italy.

Career Alternatives. Specific career opportunities for those students who have a background in foreign languages are abundant. In addition to the Foreign Service, jobs are available in business and education, both overseas and in the U.S. For example, those wishing to live (for brief or longer periods of time) and work in Italy have a choice of cities: Milan for business, Rome for international concerns in agriculture and nutrition in the F.A.O., and Florence for retail commerce and the arts, just to name a few. In the U.S., foreign-owned companies or American companies with interests in the foreign market need qualified people who are also fluent in a foreign language.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	0-24
Italian 1, 2, 3, 4, 5, and 9 (or the equivalent)	0-24
Depth Subject Matter	36
Italian 101 and 105	8
Upper division courses in literature, taught in the language	28
Must include at least one course from each of the following literary periods: (a) Early Italian, (b) Renaissance and Baroque, (c) Eighteenth through Twentieth Centuries.	
A total of 8 units in literature may be replaced by Italian 107 (highly recommended) and/or by courses in related fields such as history, art history, and music.	
<i>Note: All upper division courses are to be chosen in consultation with the major adviser.</i>	
Total Units for the Major	36-60

Recommended

One year of college Latin or a Romance Language.

Major Adviser. J. Cannon.

Minor Program Requirements:

	UNITS
Italian	20
Language, Italian 101 and 105	8
Literature, three courses chosen in consultation with major adviser	12
One course chosen from each of the following three areas: (a) Early Italian Literature, (b) Renaissance and Baroque, and (c) Eighteenth through Twentieth Centuries. (One of the above courses may be replaced by course 107 or by a course of literature in translation offered by the Italian Program).	

Prerequisite Credit. Credit will not normally be given for a course if it is a prerequisite of a course already successfully completed. Exceptions can be made only by the Program Director.

Honors and Honors Program. The honors program comprises two quarters of study under course 194H, which will include a research paper and a comprehensive examination. See also sections on University and College requirements.

Teaching Credential Subject Representative. See Major Adviser above and also the section on the Teacher Education Program in this catalog.

Courses in Italian (ITA)

Lower Division Courses

Students offering high school language preparation as a prerequisite must take a placement test.

1. Elementary Italian (5) I, II, III. Foscarini in charge
Discussion—5 hours; laboratory—1 hour. Introduction to Italian grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed Italian 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Italian (5) I, II, III. Foscarini in charge
Discussion—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of course 1 in areas of grammar and basic language skills.

3. Elementary Italian (5) I, II, III. Foscarini in charge
Lecture/discussion—5 hours. Prerequisite: course 2. Continuation of grammar sequence, and practice of all language skills through cultural texts.

4. Intermediate Italian (3) I, II, III. Director in charge
Lecture/discussion—3 hours. Prerequisite: course 3 or the equivalent. Review of grammar and syntax through written exercises, and readings of short prose works. Intended to develop the linguistic foundations of students who have completed the first-year language classes.

5. Intermediate Italian (3) I, II, III. Director in charge
Lecture/discussion—3 hours. Prerequisite: course 4 or the equivalent. Review and study of grammar and syntax, readings of short prose works, and written exercises. Intended to prepare students to read, understand and discuss modern Italian.

***8A. Italian Conversation (3) I, III.** The Staff
Discussion—3 hours. Prerequisite: course 3 or the equivalent. Course designed to offer practice in speaking Italian. May be repeated once for credit. (P/NP grading only.)

***8B. Italian Conversation (3) II.** The Staff
Discussion—3 hours. Prerequisite: course 8A. Course designed to offer practice in speaking Italian. (P/NP grading only.)

9. Reading Italian (3) I, II, III. Director in charge
Lecture/discussion—3 hours. Prerequisite: course 5. Reading and discussion of modern Italian prose, including selections from creative, scientific and journalistic writings. Introduction to contemporary Italian literature and culture, as well as a means of strengthening the student's command of the Italian language.

50. Studies in Italian Cinema (4) II. Cannon
Lecture—2 hours; discussion—1 hour; term paper. Introduction to Italian cinema through its genres. Focus is on cinema as a reflection of and a comment on modern Italian history. Film will be studied as an artistic medium and as a form of mass communication. General Education credit: Civilization and Culture.

90X. Lower Division Seminar (1-2) I, II, III. The Staff
Seminar—1-2 hours. Prerequisite: lower division standing and consent of instructor. Examination of a special topic in Italian language or culture (such as Italian culture seen through film, Italian feminism, literature, or politics) through shared readings, discussions, and written assignments, or special activities such as film screening or laboratory work.

***98. Directed Group Study (1-5) I, II.** The Staff
Primarily intended for lower division students. (P/NP grading only.)

Upper Division Courses

101. Advanced Conversation, Composition, and Grammar (4) I. The Staff
Lecture—3 hours; weekly essays. Prerequisite: course 9 or consent of instructor.

***104. Italian Translation and Style (4) III.** Dutschke
Lecture/discussion—3 hours; two research papers; term paper. Prerequisite: course 101 or consent of instructor. Practice in translation from Italian to English and English to Italian, using literary and non-literary texts of different styles. Analysis of linguistic problems and elements of style contained in the translation material.

105. Introduction to Italian Literature (4) II. The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: course 101 or consent of instructor. Introduction to the study of the principal authors, works, and movements of the Medieval, Renaissance, and Early Modern periods in Italy.

107. Survey of Italian Culture and Institutions (4) III. Foscarini
Lecture—3 hours; term paper. Assessment of the impact of regional autonomy on Italian cultural life from the Middle Ages to the present. Special emphasis will be placed upon achievements in literature, the arts, philosophy, and socio-political institutions. To be taught in English.

***112. Medieval and Renaissance Poetry: St. Francis to Petrarch (4) I.** Dutschke
Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Study of the origins of Italian religious and secular poetry of the 13th and 14th centuries. A diversified poetry is illustrated in works of St. Francis, Dante, Cavalcanti, Petrarch, the Sicilian School, the Sweet New Style Poets, and other authors. Offered in alternate years.

113. Dante Alighieri, *Divina Commedia (Inferno, Purgatorio, Paradiso)* (4) III. Dutschke
Lecture/discussion—3 hours; term paper—1 hour. Prerequisite: course 9 or consent of instructor. Study of Dante Alighieri's *Divina Commedia*, and its role in the development of Italian language and literature. Emphasis will be placed on reading the whole poem within the historical context of the Middle Ages.

***114. Boccaccio, *Decameron*, and the Renaissance *Novella* (4) II.** Dutschke
Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Study of the development of the short story in Italy, as exemplified in Giovanni Boccaccio's *Decameron*, in his predecessors and Renaissance followers. Offered in alternate years.

***115A. Studies in the Cinquecento (4) III.** Schiesari
Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Analysis of key texts from the high moment of the Italian Renaissance. The political and aesthetic legacy of humanism will be foregrounded in relation to authors such as Ficino, Ariosto, Machiavelli, Aretino, Castiglione, and Tasso. Offered in alternate years.

***115B. Italian Literature of the Renaissance and the Baroque: from Cellini to Marino (4) III.** The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: course 115A. Continued examination into the loss of an ideal. Emphasis on the conflicts in Michelangelo and Tasso leading to Marino, with an excursus on Galileo's role in the formation of a modern literary standard.

***115C. Italian Drama from Machiavelli to the Enlightenment (4) I.** Schiesari
Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Development of comic and tragic forms as critical representations of their societal and historical contexts, i.e. Machiavelli and the logic of power, Baroque dramatists in the service of counter-reformation Italy, Goldoni's comedies and bourgeois social consciousness. Offered in alternate years.

115D. Early Modern Italian Lyric (4) I. Schiesari
Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Examination of the poetic tradition influenced by Petrarch. Consideration of the relation between gender and genre in such poets as Petrarch, Bembo, della Casa, Tasso, Marino, Gaspara Stampa, Veronica Franco, Isabella di Morra. Offered in alternate years.

***118. Italian Literature of the Eighteenth Century (4) I.** The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Development of modern Italian literature. Emphasis on the work of Goldoni, Bettinelli, Baretti, Parini, Alfieri and Vico.

***119. Italian Literature of the Nineteenth Century (4) II.** The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Romanticism in Italy, including Manzoni, Verga, and *Verismo*.

***120A. Italian Literature of the Twentieth Century: *The Novel* (4) III.** Cannon
Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Development of the novel from Svevo to the present. Emphasis on the work of Svevo, Levi, Moravia, Pavese, and Vittorini.

***120B. Italian Literature of the Twentieth Century: *Poetry and Drama* (4) I.** Cannon
Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Italian poetry with emphasis on Hermeticism; the theater of Luigi Pirandello and its role in the development of contemporary Italian drama.

***131. Autobiography in Italy (4) III.** Schiesari
Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. The development of representations of selfhood with particular attention to generic conditions, the confessional tradition and the problem of women's self-representation. Authors studied may include Petrarch, Tasso, Casanova, Alfieri, Zvevok, Sibilla Aleramo and Primo Levi. Offered in alternate years.

***139B. Italian Literature in English: Boccaccio, Petrarch and the Renaissance (4) II.** Dutschke
Lecture/discussion—3 hours; term paper. Petrarch and Boccaccio and their relations to the Middle Ages and the Renaissance; the Renaissance, with particular attention to the works of Lorenzo de' Medici, Leonardo da Vinci, Machiavelli, Ariosto, Michelangelo, and Tasso.

***140. Italian Literature in English Translation: Dante, *Divine Comedy* (4) I.** Dutschke
Lecture/discussion—3 hours; term paper—1 hour. Prerequisite: any course from the GE Literature Preparation List. Reading of Dante Alighieri's *Divine Comedy*, through the otherworld realms of Inferno, Purgatory, and Paradise. General Education credit: Civilization and Culture.

***141. Culture, Gender and the Italian Renaissance (4) II.** Schiesari
Lecture/discussion—3 hours; term paper. Prerequisite: any course from the GE Literature Preparation List. Critical analysis of texts from the Italian Renaissance. Primary concern focuses on issues such as "the dignity of Man;" education and gender politics; "high" and "low" culture and its relation to literary practices. General Education credit: Civilization and Culture.

142. Masterpieces of Modern Italian Narrative (4) III. Cannon
Lecture—1.5 hours; discussion—1.5 hours; term paper. Prerequisite: either English 3, Comparative Literature 2, or History 4C. Analysis of major works of Italian narrative fiction from unification of Italy to present. Students will learn to use representative methods and concepts which guide literary scholarship. Consideration of works within European social and cultural context. Offered in alternate years. General Education credit: Civilization and Culture.

145. Special Topics in Italian Literature (4) I, II, III. The Staff (Director in charge)
Lecture/discussion—4 hours. Prerequisite: course 9 or consent of instructor. Study of special topics and themes in Italian literature, such as comic literature, epic poetry, pre-twentieth century theater, fascism, futurism, women and literature, and the image of America, etc. May be repeated for credit when topic changes.

190X. Upper Division Seminar (1-2) I, II, III. The Staff (Chairperson in charge)
Seminar—1-2 hours. Prerequisite: upper division standing and consent of instructor. In-depth examination of a special topic in Italian language or culture through shared readings, discussions, written assignments or special activities such as film screening or laboratory work. Limited enrollment. May not be repeated for credit.

192. Italian Internship (1-12) I, II, III, IV. The Staff (Director in charge)
Internship—3-36 hours. Prerequisite: upper division standing and consent of chairperson of Italian Department. Participation in government and business activities to gain work experience and to develop a better knowledge of Italian language and culture. (P/NP grading only.)

194H. Special Study for Honors Students (1-5) I, II, III. The Staff
Independent study—1-5 hours. Prerequisite: open only to majors of senior standing who qualify for honors program. Guided research, under the direction of a faculty member, leading to a senior honors thesis in a topic in Italian literature, civilization, or language studies. (P/NP grading only.)

197T. Tutoring in Italian (1-4) I, II, III. The Staff
Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing and consent of instructor. Tutoring in undergraduate courses, including leadership in small voluntary discussion groups affiliated with departmental courses. May be repeated for credit for a total of 6 units. (P/NP grading only.)

197TC. Community Tutoring in Italian (1-5) I, II, III. Foscarini
Discussion—1-2 hours; laboratory—2-4 hours. Prerequisite: consent of instructor. Field experience as Italian tutors or teacher's aides. May be repeated for credit for a total of 10 units. (P/NP grading only.)

198. Directed Group Study (1-4) I, II, III. The Staff (Director in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Director in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

297. Individual Study (1-5) I, II, III. The Staff (Director in charge)
Prerequisite: graduate standing or consent of instructor.

298. Group Study (1-5) I, II, III. The Staff (Director in charge)
Prerequisite: graduate standing or consent of instructor.

299. Research (1-12) I, II, III. The Staff (Director in charge)
Prerequisite: graduate standing or consent of instructor. (S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (Director in charge)
Prerequisite: graduate standing or consent of instructor. (S/U grading only.)

Land, Air and Water Resources

(College of Agricultural and Environmental Sciences)

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Jan W. Hopmans, Program Director, Hydrologic Science Unit

Randy J. Southard, Ph.D., Program Director, Soils and Biogeochemistry Unit

Bryan C. Weare, Ph.D., Program Director, Atmospheric Science Unit

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André E. Läuchli, Ph.D., Professor (Plant Nutrition)

James H. Richards, Ph.D., Associate Professor
(Plant Nutrition)

Dennis E. Rolston, Ph.D., Professor (Soil Science)

Kate M. Scow, Ph.D., Assistant Professor (Soil Science)

Wendy Kuhn Silk, Ph.D., Professor (Hydrologic Science)

Michael J. Singer, Ph.D., Professor (Soil Science)

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(Soil Genesis/Morphology)

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H. Michael Reisenauer, Ph.D., Professor Emeritus

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Harry O. Walker, Ed.D., Senior Lecturer Emeritus

Lynn D. Whittig, Ph.D., Professor Emeritus

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Edward A. McBean, Ph.D., Professor (Hydrologic Science)

Donald R. Nielsen, Ph.D., Professor (Soil and Water Science)

Marc B. Parlange, Ph.D., Associate Professor
(Biological and Agricultural Engineering, Hydrologic Science)

Terry L. Pritchard, M.S., Lecturer (Hydrologic Science)

Carlos E. Puente, Ph.D., Assistant Professor
(Hydrology)

Lawrence J. Schwankl, Ph.D., Lecturer (Hydrologic Science)

Kenneth K. Tanji, M.S., Professor (Hydrologic Science)

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Robert M. Hagan, Ph.D., Professor Emeritus

Delbert W. Henderson, Ph.D., Professor Emeritus

Allen W. Knight, Ph.D., Professor Emeritus

William O. Pruitt, Jr., Ph.D., Lecturer Emeritus

Frank E. Robinson, Ph.D., Lecturer Emeritus

Verne H. Scott, Ph.D., Professor Emeritus

Land, Air and Water Resources is a multidisciplinary department with faculty who specialize in atmospheric, plant, resource, soil and water science, hydrology, and water engineering. Teaching and research focus on both agricultural and environmental science. The faculty contribute to numerous other undergraduate and graduate programs in the Colleges of Letters and Science, Engineering, and Agricultural and Environmental Sciences.

Major Programs. Undergraduates in the department major in Atmospheric Science, Environmental and Resource Sciences, Hydrologic Science, and Soil and Water Science.

Advising Center is located in 111A Veihmeyer Hall and 148 Hoagland Hall (916-752-1669).

Graduate Study. Four graduate programs, Atmospheric Science, Hydrologic Science, Soil Science, and Water Science are administered by Land, Air and Water Resources.

Courses. See courses listed under Atmospheric Science, Hydrologic Science, Environmental and Resource Sciences, and Soil Science.

Graduate Study. Graduate work offered in the area of resource sciences is Atmospheric Science, Hydrologic Science, and Soil Science. Detailed information can be obtained from graduate advisers for these areas and the *Graduate Announcement*.

Japanese

See Chinese and Japanese

Landscape Architecture

(College of Agricultural and Environmental Sciences)

Faculty. See under Department of Environmental Design.

The Major Program

Landscape architecture is the planning and design of land areas where human use requires adaptation or conservation of the environment. Students who study landscape architecture are concerned about the welfare of the environment and the people who use it. They are capable of solving physical problems and are able to visualize and "think" in terms of spaces and three-dimensional concepts.

The Program. The curriculum balances creativity and visual and spatial skills with technological expertise and a thorough background in physical, natural, and social sciences. Students develop proficiency at problem-solving relating to design of parks, urban open spaces, energy-efficient neighborhoods, land reclamation projects, and landscape planning for wilderness and scenic regions, coastal and riparian environments, and other sensitive land areas. A process-oriented approach to design is stressed and environmental and community values are emphasized.

Preparatory Requirements. Students are admitted to the landscape architecture major only after submitting a portfolio for review and selection by the faculty. Contact the Environmental Design Advising Center or the Landscape Architecture major adviser for further information.

Career Alternatives. Graduates may find jobs in private landscape architectural firms or public agencies and corporations employing landscape architects. The landscape architecture major provides the student with excellent preparation for graduate school or career development in a wide range of environmental and design-related fields.

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

UNITS

English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	50-59
Biological sciences (Biological Sciences 1A, 10)	4-5
Biological Sciences 1C	5
Chemistry (Chemistry 2A, 10)	4-5
Physics (Physics 1A, 5A, 10)	3-4
Two-dimensional design (Art 16, Design 21, Engineering 4)	3-4
Three-dimensional design (Art Studio 5, 121A, 142, Design 134A-134B-134C, 135, 180A, 180C)	4
Earth sciences (Geography 1, Geology 1, Soil Science 10)	3
Economics (Economics 1A, 1B, Agricultural Economics 147)	4-5
Computer science (Agriculture Systems and Environment 21, Engineering 5, Computer Science Engineering 10, 40)	3-4
Mathematics (Mathematics 16A, 36, Statistics 13, Agricultural Systems and Environment 120)	3-4
Social science (Anthropology 2, Geography 2, 5, Psychology 1, 16, Sociology 1)	3-5
Humanities elective	3
Depth Subject Matter	70-74
Introduction to landscape architecture (Landscape Architecture 40)	3

Landscape architecture studio: introduction, recreational open space, site planning (Landscape Architecture 111, 112, 113)	12
Landscape graphic communication (Landscape Architecture 121)	4
Advanced communication for landscape architecture (Landscape Architecture 122)	4
Introduction to landscape construction, site engineering, construction details and drawings (Landscape Architecture 131, 132, 133, 134)	15
History of landscape architecture (Landscape Architecture 140)	3
Introduction to environmental plants (Environmental Horticulture 6)	2
Taxonomy and ecology of environmental plants (Environmental Horticulture 105)	4
Arboriculture (Environmental Horticulture 133)	4
Plant selection for environmental design (Landscape Architecture 155)	3
Landscape planting design (Landscape Architecture 156)	4
Landscape architecture studio: planning and analysis, urban and community design (Landscape Architecture 181, 182)	8
Senior project in landscape architecture (Landscape Architecture 193)	1-5
Proseminar, three quarters (Landscape Architecture 190)	3
Internship (Landscape Architecture 192) recommended.	

Breadth Subject Matter

Resource sciences, two upper division courses with approval of adviser	6-8
Ecology (Environmental Studies 100, 110, Botany 117, Entomology 104, Zoology 114A, 114B, 125)	3-5
Environmental awareness (Psychology 144)	4
Related disciplines elective	4
Course to emphasize a discipline peripheral to landscape architecture (Environmental Biology and Management 110, 116, 122, 127, Environmental Studies 126, 161, 171, Agricultural Economics 18, Civil and Environmental Engineering 1, Design 1)	

Unrestricted Electives

Total Units for the Major	180
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Major Adviser. S. McNeil.

Advising Center is located in 152 Walker Hall (916-752-1165).

Graduate Study. Refer to the Graduate Studies section in this catalog.

Courses in Landscape Architecture (LDA)

Lower Division Courses

11. Landscape Studio: Introduction (4) II. The Staff Studio—8 hours. Prerequisite: courses 21 and 40 (may be taken concurrently). Introductory studio problems in landscape architectural design equally emphasizing exposure to design arts, human factors, and natural resource planning. Emphasis is placed on functional and aesthetic considerations for small scale projects.

21. Landscape Drafting and Visualization (4) I. The Staff Studio—8 hours; two all-day field trips. Prerequisite: course in free-hand drawing recommended. Development of idea expression through graphic media and the use of drawing techniques for visual representation, including plan, section, and axonometric drawing. Includes an introduction to computerized drafting and drawing.

22. Landscape Graphic Communication (4) II. The Staff Studio—8 hours; two all-day field trips. Prerequisite: course 21 or the equivalent. Graphic representation of

landscape architectural designs. Emphasis will include sketching, perspective, rendering techniques, sheet layout, lettering and type use, and color use.

23. Computer Graphics for Landscape Architects (4) III. McNeil

Studio—8 hours; two all-day field trips. Prerequisite: course 22. Landscape architectural communications explored through the computer. Includes computerized drafting, drawing, rendering, desktop publishing, and photorealistic simulation.

40. Introduction to Landscape Architecture (3) I. Schenker

Lecture—3 hours. History, theory, philosophy, techniques and applications of landscape architecture and the analysis, planning, design, and management of outdoor spaces. General Education credit: Civilization and Culture.

Upper Division Courses

111. Intermediate Landscape Architecture

Studio 1 (4) II. Thayer and Owens Studio—8 hours; two all-day field trips. Prerequisite: courses 11, 23, 40, and junior standing in landscape architecture. Studio projects focusing on site analysis and site planning, including the siting of structures, design of circulation systems, outdoor facilities and open spaces. Emphasis on energy-conserving and culturally responsive design.

112. Intermediate Landscape Architecture

Studio 2 (4) II. Schenker and staff Studio—8 hours; two all-day field trips. Prerequisite: course 111. Studio projects focus on visual, spatial, aesthetic and symbolic characteristics of site design. Emphasis on relationship between form and meaning.

113. Intermediate Landscape Architecture

Studio 3 (4) III. McNeil and staff Studio—8 hours; two all-day field trips. Prerequisite: course 112. Introduction to regional landscape analysis techniques and methods. Studio projects in the analysis, planning, and design of intermediate-scale and large-scale landscapes.

120. Advanced Computer Applications (4) Summer. McNeil

Studio—8 hours; two all-day field trips. Prerequisite: course 23. Studio work using computer-aided design, geographic information systems, and other advanced computer programs.

122. Advanced Communication for Landscape Architects (4) III. Francis

Studio—8 hours; two all-day field trips. Prerequisite: course 23. Advanced concepts in multimedia and graphic presentation of landscape architecture projects, to include preparation of proposals, reports, audio-visual productions, and mixed-media presentations. Limited enrollment.

131. Landscape Architecture: Materials and Detailing (4) I. The Staff

Studio—8 hours; two all-day field trips. Prerequisite: courses 11, 23; open to majors in Landscape Architecture. Introduction to landscape construction with a focus on the materials and detailing of concrete, stone, and wood. Preparation of cost estimates and specifications will be introduced.

132. Landscape Construction: Site Engineering (4) II. McCulley

Studio—8 hours; two all-day field trips. Prerequisite: course 131. Topographic and grading problems in landscape engineering: drainage plans, grading plans, spot elevations, road alignment, sections and profiles and cut and fill calculations. Limited enrollment.

133. Landscape Construction: Advanced Systems (4) III. McCulley

Studio—8 hours; two all-day field trips. Prerequisite: course 132. Advanced study of materials and methods in landscape construction. Emphasis on drainage and irrigation systems, fountains, and roof deck design.

134. Landscape Construction: Professional Practice and Construction Documents (4) I. McCulley

Studio—8 hours; two all-day field trips. Prerequisite: course 133. Legal and professional aspects of landscape architecture, including the development of con-

struction documents (drawings and specifications), proposal writing, fee calculations, project management, cost estimation, and insurance.

140. History of Landscape Architecture (3) III. Schenker

Lecture—3 hours. History of landscape architecture as an art form, technology, and profession. Emphasizes design of gardens and outdoor spaces from prehistoric civilizations to the present. General Education credit: Civilization and Culture.

155. Plants in the Cultural Environment (3) II. The Staff

Lecture—3 hours. Prerequisite: Biological Sciences 10. Cultural parameters of selecting plants for use in environmental design and planning. Contemporary themes in climate, energy and resource conservation, low maintenance, aesthetics, edible landscapes, historic preservation, native plants, specialized gardens, and computerized plant selection. General Education credit: Nature and Environment.

156. Landscape Planting Design (4) I. The Staff
Studio—8 hours. Prerequisite: course 111, 155, Environmental Horticulture 105. Application of aesthetic, functional, and horticultural principles to the composition of the planted landscape and the development of planting plans.

***159. Public Garden Management (3) III.** Dawson
Lecture—3 hours. Prerequisite: Biological Sciences 1C, Plant Science 2, or Environmental Horticulture 6. Management of the collections, facilities and programs of public gardens. Emphasis is placed on the management skills and operational techniques utilized in public gardens.

181. Landscape Architecture Studio: Planning and Analysis (4) I. The Staff

Studio—8 hours; two all-day field trips. Prerequisite: course 113. Landscape architecture studio to include the solution of large-scale landscape architectural problems with emphasis on landscape planning and analysis methods and environmental concerns. Limited enrollment.

182. Landscape Architecture Studio: Urban and Community Design (4) II. Francis

Studio—8 hours; two all-day field trips. Prerequisite: course 181. Solution of community and urban landscape design problems with emphasis on community and social processes, participatory design methods, and comprehension of behavioral factors relating to urban open space. Limited enrollment.

183. Landscape Ecology (4) I. The Staff
Studio—8 hours. Prerequisite: course 113 and Environmental Studies 100 or consent of instructor. Practical exercises in ecological design emphasizing conservation, habitat restoration, cultural impacts, and bioregionalism. Emphasis is placed on management techniques, restorative methodology, and physical land use planning.

184. Sustainable Landscape Architecture (4) II. Thayer

Studio—8 hours. Prerequisite: course 113 or consent of instructor. Planning and design of land areas for social and environmental stability creating sustainable landscapes which conserve water, energy, arable soil, and biological diversity.

190. Proseminar in Landscape Architecture (1) I, II, III. McNiel, Francis, Schenker
Seminar—1 hour. Lectures and discussion of critical issues in landscape architecture. May be repeated three times for credit. (P/NP grading only.)

192. Internship in Landscape Architecture (1-12) I, II, III. The Staff

Internship. Prerequisite: senior standing in Landscape Architecture major. Professional field experience in landscape architecture. May be repeated for a total of 12 units. (P/NP grading only.)

193A. Senior Project in Landscape Architecture (3) II. Owens

Studio—6 hours. Prerequisite: senior standing in Landscape Architecture major. Projects will focus on a critical area of landscape architectural design, planning, analysis, communication, or research. Limited enrollment. Required of all landscape architecture majors. (P/NP grading only.)

193B. Senior Project in Landscape Architecture (4) III. Owens

Studio—8 hours. Prerequisite: course 193A and senior standing in Landscape Architecture. Projects will focus on a critical area of landscape architectural design, planning, analysis, communication, or research. Limited enrollment. Required of all landscape architecture majors. (P/NP grading only.)

197T. Tutoring in Landscape Architecture (1-5) I, II, III. The Staff

Tutoring—3-15 hours. Prerequisite: consent of instructor. Tutoring in landscape architecture courses. (P/NP grading only.)

198. Directed Group Study in Landscape Architecture (1-5) I, II, III. The Staff (Master Adviser in charge)

Prerequisite: consent of instructor. Directed group study. (P/NP grading only.)

199. Special Study for Advanced Undergraduates in Landscape Architecture (1-5) I, II, III. The Staff (Master Adviser in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

***201. Theory and Philosophy of the Designed Environment (4)**

Seminar—4 hours. Prerequisite: course 140 or the equivalent; graduate standing or consent of instructor. Examines the major theories of environmental design. Epistemology of design serves as framework to examine modern landscape architecture, architecture, urban design and planning. Normative theories of design are reviewed along with the social and environmental sciences. Offered in alternate years.

***202. Methods in Design and Landscape Research (4) II.** McNiel

Seminar—4 hours. Prerequisite: Statistics 102 or the equivalent; graduate standing or consent of instructor. Explores many of the research and advanced design and planning methods employed in landscape architecture. Exercises provide the student with a vehicle for designing independent landscape research and creative activities. Lectures provide an historical overview of research methodology. Offered in alternate years.

***203. Perceptions of Environmental Quality (4)**

Seminar—4 hours. Prerequisite: Psychology 144 or consent of instructor. Examines human perceptual responses to the physical environment beginning with aesthetics and leading to more complex cognitive evaluations and personal and social interpretations of environmental quality. Discusses means by which intervention by design can affect human/environmental perception, cognition, and behavior. Offered in alternate years.

***204. Case Studies in Landscape Design and Research (4) II.** The Staff

Laboratory—8 hours. Prerequisite: contact department for prerequisite courses; graduate standing or consent of instructor. Case studies in landscape design and research have as their primary goal the exposure of the student to real-world, designed-environment situations where creative activity and/or basic research is the primary product. Offered in alternate years.

***210. Advanced Landscape Architecture Studio (4) III.** Schenker

Laboratory—8 hours. Prerequisite: course 113 or the equivalent; graduate standing or consent of instructor. Exposes students to real-world, designed-environment situations where creative activity and/or basic research is the primary product. Advanced landscape problems will be utilized at the site, urban or rural scale. Offered in alternate years.

220. Public Space and Culture (3) III. Francis

Seminar—3 hours. Prerequisite: course 182 or the equivalent; graduate standing or consent of instructor. Explores the public environment of cities including their streets, parks, and squares. Public life and culture of American cities is examined and design responses to this culture evaluated. Typology is used to identify spaces. Offered in alternate years.

240. Rural Landscape Planning and Design (3) II. McNiel

Seminar—3 hours. Prerequisite: course 181 or the equivalent; graduate standing or consent of instructor. Addresses physical planning issues facing rural farmsteads, subdivisions, commercial zones, and small communities in their challenge of economic and social change. Concern is with runaway growth, shrinking populations, shifting economies, and lack of public funds or consensus. Offered in alternate years.

250. Technology and Sustainable Landscape (3) III. Thayer

Seminar—3 hours. Prerequisite: course 184 or the equivalent; graduate standing or consent of instructor. Explores the relationship between technology and landscape quality. Typology of technological landscape adaptations is presented and impacts of these technologies are discussed. Emphasizes a theoretical understanding of technological change and a practical approach to sustainable technologies. Offered in alternate years.

***280. Landscape Conservation (3) II.** The Staff
Seminar—3 hours. Prerequisite: contact department for prerequisite courses; graduate standing or consent of instructor. Focus is on land planning, design, and management techniques to further the goal of resource preservation. Examines current critical theory in the establishment and management of conservation areas. Offered in alternate years.

290. Graduate Seminar in Landscape Architecture (2) I, II, III. The Staff

Seminar—2 hours. Prerequisite: graduate standing and consent of instructor. Seminar on selected topics in landscape architecture research, analysis, planning, design, communication, or education. May be repeated for credit. (S/U grading only.)

297. Practicum in Landscape Architecture (1-10) I, II, III. The Staff

Independent study—1-10 hours. Prerequisite: graduate standing and consent of instructor. Opportunity for students to work directly in the field with academics at other institutions or with professionals in an office setting. Gives experience beyond the confines of campus and allows direct interaction with the community. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff

Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

299. Directed Individual Research for Graduate Students (1-5) I, II, III. The Staff

Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Latin

See Classics

Law, School of

Bruce A. Wolk, J.D., Dean

Rex R. Perschbacher, J.D., Associate Dean (Academic Affairs and Research)

Antonia E. Bernhard, J.D., Assistant Dean (Student Affairs)

George S. Grossman, LL.B., M.S.L.S., Director (Law Library)

Dean's Office, 1011 Martin Luther King, Jr. Hall (916-752-0243)

Faculty

Vickram Amar, J.D., Acting Professor

John D. Ayer, J.D., LL.M., Professor

Antonia E. Bernhard, J.D., Lecturer

Alan E. Brownstein, J.D., Professor

Carol S. Bruch, J.D., Professor
 Joel C. Dobris, LL.B., Professor
 Harrison C. Dunning, LL.B., Professor
 Floyd F. Feeney, LL.B., Professor
 Daniel Wm. Fessler, J.D., S.J.D., Professor
 Arturo Gándara, J.D., Acting Professor
 Michael J. Glennon, J.D., Professor
 Gary Goodpaster, J.D., Professor
 George Grossman, LL.B., M.S.L.S., Professor
 Sarah D. Gray, Ph.D., Professor (*Human Physiology*)
 Robert W. Hillman, J.D., Professor
 James E. Hogan, LL.B., Professor
 Edward J. Imwinkelried, J.D., Professor
 Margaret Z. Johns, J.D., Lecturer and Director of
 Legal Writing
 Kevin R. Johnson, J.D., Professor
 Ellen R. Jordan J.D., Professor
 Friedrich K. Juenger, J.D., Professor
 Leslie A. Kurtz, M.A., J.D., Professor
 Evelyn A. Lewis, J.D., Acting Professor
 Millard Murphy, B.A., J.D., Lecturer
 John B. Oakley, J.D., Professor
 Rex R. Perschbacher, J.D., Professor
 John W. Poulos, J.D., Professor
 Edward H. Rabin, LL.B., Professor
 Daniel L. Simmons, J.D., Professor
 James F. Smith, J.D., Lecturer
 Martha S. West, J.D. Professor
 Bruce A. Wolk, J.D., Professor
 Richard C. Wydick, LL.B., Professor

Emeriti Faculty

Homer G. Angelo, J.D., LL.M., Professor Emeritus
 Edward L. Barrett, Jr., J.D., Professor Emeritus
 Florian Bartosic, B.C.L., LL.M., Professor Emerita
 Daniel J. Dykstra, LL.B., S.J.D., Professor Emeritus
 Pierre R. Loiseau, LL.B., LL.M., Professor Emeritus
 Raymond I. Parnas, J.D., LL.M., S.J.D., Professor
 Emeritus
 Mortimer D. Schwartz, J.D., LL.M., Professor Emeritus

Courses of Instruction. The following courses for students enrolled in the School of Law are set up for the semester-system basis only. Instruction dates can be found at the end of the School of Law section at the front of the catalog. The symbols are (I) for Fall Semester and (II) for Spring Semester.

Courses in Law (LAW)

Professional Curriculum

First Year Courses

200. Introduction to Law (1) I. Perschbacher
 Discussion—1 hour. Introduction to basic concepts of the law, the historical roots of common law and equity, the precedent system in its practical operation, the modes of reasoning used by courts and attorneys, and the fundamentals of statutory interpretation. (S/U grading only.)

201. Property (4) I. Dobris, Lewis
 Discussion—4 hours. Study of doctrines and concepts of property law with primary emphasis on real property. Course coverage includes the estates in land system, the landlord-tenant relationship, conveyancing, and private and public land use control.

202A-202B. Contracts (3-3) I-II. Gandara, Imwinkelried
 Discussion—3-3 hours. Course examines the sorts of promises that are enforced and the nature of protection given promissory obligations in both commercial and noncommercial transactions. Inquiry is made into the means by which traditional doctrine adjusts—or fails to adjust—to changing social demands. (Deferred grading only, pending completion of sequence.)

203. Civil Procedure (5) I. Amar, Johnson, Oakley
 Discussion—5 hours. Study of the fundamental and recurrent problems in civil actions including the methods used by federal and state courts to resolve civil disputes. Among the topics covered are the relation between federal and state courts; the power of courts over persons, property, and subject matter (jurisdiction); the scope of litigation (joinder of claims and parties); preparation for trial through pleading, discovery,

and pretrial; devices for resolving actions and issues before and during trial; functions of judge and jury; and the finality of the trial court's disposition.

204A-204B. Torts (3-2) I. Kurtz, Oddi; II. Johns, Juenger
 Discussion—3-2 hours. Legal concepts which apply to actions brought by litigants who seek relief for injury. Intentional and unintentional invasions of personality and property. Analysis of civil actions based upon wrongs such as assault, battery, false imprisonment, negligence, strict liability, defamation, invasion of privacy, and misrepresentation. (Deferred grading only, pending completion of sequence.)

205. Constitutional Law I (4) II. Brownstein, Glennon
 Discussion—4 hours. The principles, doctrines, and controversies regarding the basic structure of, and division of powers in, American government. In particular, course treats judicial review, jurisdiction, standing to sue, federalism, federal and state powers and immunities, and the separation of powers between branches of the federal government. It also begins an examination, continued in course 218, of procedural and substantive constitutional rights and the limits they place on governmental action. Economic substantive due process, procedural due process, and rights of privacy and personal autonomy will also be addressed.

206. Criminal Law (3) I. Feeney, Johns, Poulos
 Discussion—3 hours. Study of the bases and limits of criminal liability. Coverage of the constitutional, statutory, and case law rules which define, limit, and provide defenses to individual liability for the major criminal offenses.

207. Legal Research (1) I. Bernhard
 Discussion-laboratory—1 hour. Description of the variety of sources of law and secondary authority. Instruction in their location and use. Graded on basis of weekly self-teaching research drills. No final examination.

208. Legal Writing (2) II. Bernhard, Johns
 Lecture—2 hours. Instruction in the form and substance of writing. A variety of law-related documents will be discussed and drafted. An experience in oral advocacy will be included. Graded on the basis of the writing and advocacy assignments. No final examination.

Second and Third Year Courses

The second- and third-year courses fall into subject areas as shown here

- (a) General courses: 209, 212, 217, 222, 226, 239, 240, 244, 250, 254, 258, 259, 266, 267, 268, 271, 280, 286, 292, 296
- (b) Business Law: 210, 212, 213, 214, 215, 216, 228, 236, 241, 243, 253, 262, 269, 270, 274, 295
- (c) Constitutional Law: 218, 288
- (d) Criminal Law: 227, 245, 276, 290
- (e) Estate Planning: 221, 223, 294
- (f) Family Law: 225, 234, 272, 273
- (g) International Comparative and Foreign Law: 217, 230, 233, 248, 249, 252, 257, 290, 291
- (h) Labor and Employment Relations Law: 251, 255, 260, 279
- (i) Procedure and Jurisdiction: 242, 246, 275, 283
- (j) Property and Environmental Law: 229, 232, 256, 264, 265, 282, 285, 287, 289
- (k) Public Law: 231, 235, 261, 293
- (l) Skills and Litigation: 211, 219, 263, 278, 297, 410A, 410B, 412, 413, 414, 415
- (m) Taxation: 220, 238, 247
- (n) Individual and Group Study: 298, 299, 416, 417, 418, 419, 495
- (o) Clinical Programs: 420, 425, 430, 440, 450, 455, 460, 465, 470, 480

*209. Alternative Dispute Resolution—Techniques and Practice (2)

Discussion—2 hours. Course focuses on the theory of alternative dispute resolution (ADR). History and evolution of alternatives to the judicial system for resolution of disputes. Particular emphasis given to understanding the distinctions between: (a) binding

arbitration, (b) non-binding arbitration, (c) statutory arbitration, (d) contractual arbitration, (e) mediation, (f) private judging, and (g) mediarbitration. Examines the question of whether or not to use a form of alternative dispute resolution and if such selection is made, tactics and strategies that may be applicable. Second portion of the course is clinical. Students will be expected to participate in various forms of alternative dispute resolution procedures. Case scenarios provided by the instructors. Additionally, students encouraged (but not required) to attend ADR proceedings with the instructors in connections with their practice. Guest presentations from arbitrators and judges engaged in private judging. Limited enrollment.

*210. Business Reorganizations (2)

Discussion—2 hours. Prerequisite: course 243 recommended. Focus is on businesses trying to survive when they are in substantial debt, exploring the structure of relief available under Chapter 11 of the Bankruptcy Code. Focus is on the goals of a troubled debtor and the strategies or options available to meet them.

211. Negotiation and Dispute Resolution (2) I-II.

Jordan
 Discussion—2 hours. Course teaches negotiation and mediation skills and theories. Students will do five or more practice negotiations or mediations to develop skills, perception, and personal style. Class discussion and theory development are based on these exercises. Limited enrollment.

212. Financial Information and the Law (3) I. Ayer

Discussion—3 hours. Prerequisite: students with more than two semesters of accounting will not be admitted, except with consent of instructor. Reading and evaluating financial documents—balance sheets, income statements, etc., with the purpose of learning what they tell, and fail to tell, about the value of an enterprise. A few weeks of study on the mechanics of accounting, but focus primarily will be on the job of the lawyer in helping clients to prepare and use material of this sort. Consideration of what investors and creditors expect out of financial documents. Responsibilities of the client and the lawyer in furnishing documents to regulators. The liability of preparers (including lawyers) for real or supposed deficiencies in disclosure documents.

*213. Business Organizations I (3)

Discussion—3 hours. Focus on the legal problems of a business owned by a few persons each of whom may seek to play an active role in the enterprise. Included within the survey are the problems of the "close corporation" and the alternatives to incorporation for persons in quest of profit. These alternatives include the sole proprietorship, general and limited partnerships and joint ventures. Related agency concepts are integrated into this material.

*214. Business Organizations II (3)

Discussion—3 hours. Focus on the public issue corporation. Both statutory and judge-made legal principles of state corporate law, and federal regulation of the corporation will be studied. Corporate governance and the proxy voting system, insider trading, suits against corporations, regulation of the sale of securities and distribution of dividends, and the merger and acquisition of corporations will be covered.

215. Business Associations (4) I. Lewis; II. Dykstra
 Discussion—4 hours. Course provides a broad survey of the legal rules and concepts applicable to business associations, both public and closely held. Principal attention is given the corporate form of organization, although partnerships are also treated briefly. Topics surveyed include the planning of business transactions, the process of incorporation, the financing of corporations, the role of managements and shareholders, the federal securities laws, and social responsibility.

216. Commercial Law: Article 9 (3) I. Rimeil
 Discussion—3 hours. Prerequisite: course 243 recommended. Course covers security interests in personal property.

217. Institutional and Legal Aspects of International Telecommunications (2) II.

Angelo, Gándara
 Discussion—2 hours. Examines the impact of international law, treaties, and selected regional (European Union) and national laws on the expanding fields of telecommunication and space law. Links between international organizations such as the ITU, Inmarsat Eutelsat, and Intelsat, national institutions such as NASA, NTIA, and the FCC, and private entities will be surveyed. Special legal problems such as business techniques, protection of hardware and software, industrial and intellectual property, piracy, freedom of information, restraint on competition, and protection of privacy will be examined. Limited enrollment.

218. Constitutional Law II (3) I.

Brownstein; II. Amar
 Discussion—3 hours. Course principally covers the First Amendment and the Equal Protection Clause. The First Amendment study involves an examination of freedom of speech and assembly, focusing on the various kinds of speech the courts have identified and their constitutional significance: political speech, commercial speech, offensive speech, obscenity, fighting words, and speech constituting a clear and present danger. Attention will also be directed to issues involving the forum in which speech occurs: prior restraint, overbreadth, vagueness doctrine, and the protection provided symbolic expression. The equal protection study will examine suspect class doctrine involving discrimination on the basis of race, gender, alienage, and other characteristics; affirmative action, the problem of "invidious motive," state action, and the extent to which the equal protection clause prevents government from burdening the exercises of fundamental rights. If time permits, the Establishment Clause and the Free Exercise Clause will also be considered.

219. Evidence (4) I.

Imwinkelried; II. Hogan
 Discussion—4 hours. The rules regarding the admissibility of testimonial and documentary proof during the trial of civil and criminal cases, including the concept of relevancy, the hearsay rule, the examination and impeachment of witnesses, the opinion rule, constitutional and statutory privileges.

220. Federal Income Taxation (4) I.

Mercereau; II. Raskind
 Discussion—4 hours. Introduction to basic principles of federal income taxation. Topics include identification of income subject to tax, gains and losses from property transactions, deductions from income, the timing of income and deductions (tax accounting), and the identity of persons subject to tax on particular items of income.

221. Trusts, Wills and Decedents' Estates (3) I.

Lewis; II. Dobris
 Discussion—3 hours. Study of the law of wills and trusts. Course coverage includes: intestate succession; family protection and limits on the power of testation; execution, revocation and revival of wills; contracts to make wills; will substitutes; inter vivos and testamentary private trusts. Depending on the instructor the course may also cover one or more of the following topics: class gifts; powers of appointment; the Rule Against Perpetuities; and introduction to the administration of estates and trusts, including powers, duties, rights and liabilities of fiduciaries and the management of assets.

***222. Agricultural Law (3)**

Discussion—3 hours. Exportation and importation of agricultural products will be covered, including tariffs, quotas, and non-tariff barriers, the General Agreement on Tariffs and Trade (the GATT), United States trade legislation (escape clause, and antidumping and countervailing duties) and the General System of Preferences. The trading regimes of America's major agricultural trading partners, the European Community, Canada (the agricultural aspects of the Free Trade Agreement), and Mexico will be analyzed.

***223. Estate Planning (2)**

Seminar—2 hours. Prerequisite: course 221. Selected topic(s) in the estates and trusts area. Class presentation and research paper will satisfy the legal writing requirement. Limited enrollment.

***224. Consumer Transaction (3)**

Discussion—3 hours. Study of selected consumer law problems, including a survey of state and federal regulatory efforts. Course coverage may include the following: common law and statutory approaches to fraudulent or deceptive practices, disclosure of information, consumer credit regulation, equal credit opportunity legislation, quality standards, enforcement by the creditor, consumer remedies, and attorney fees for representing consumers.

225. Marital Property (3) I.

Bruch
 Discussion—3 hours. The California community property system including rights of spouses and treatment of property during marriage; characterization, valuation, and division of property upon termination of marriage by dissolution, nullity, or death; and premarital contractual agreements. Also covered are nonmarital cohabitation, creditor's rights, and spousal support.

***226. Mass Media Law (2)**

Discussion—2 hours. Course will survey legal issues associated with the mass media. Topics covered will include legal problems of news media and news gathering, the regulation of broadcasting, free press/fair trial, and cable television, and the effect of the new technologies.

227. Criminal Procedure (3) I.

Feeney; II. Parnas
 Discussion—3 hours. The police function: arrest, search and seizure, electronic surveillance, entrapment, police interrogation and confessions, lineups, the exclusionary rule, the role of counsel.

***228. Business Planning (3)**

Discussion—3 hours. Prerequisite: courses 220, and either courses 213 and 214 or course 215. Consideration of selected problems in business planning.

***229. Commercial Real Estate Transactions Seminar (3)**

Seminar—3 hours. Planning, negotiating, and drafting involved in commercial real estate transactions. Students work on a series of transactions that might include a purchase and sale transaction, a loan construction transaction, a joint venture transaction. Students learn to determine client objectives, to develop a transaction structure to achieve these objectives, and to prepare documents involved in the transaction.

***230. International Law and World Order (2)**

Seminar—2 hours. Examines the challenges posed to international law by the end of the cold war, including implications for international organization, collective security arrangements, international environmental safeguards, democratization, theories of international law, and related topics. Satisfies advanced legal writing requirement.

231. Legislative Process (3) I.

Salerno
 Discussion—3 hours. Course covers fundamental elements of the legislative process, including legislative procedure; the legislature as an institution; the legislative investigative power; lobbying; legislative-executive relations; and the legislature's constitutional powers and limitations.

232. Real Estate Finance (4) II.

Rubin
 Discussion—4 hours. Examination of the problems involved in the acquisition, financing, and development of real estate, and of lender remedies and debtor protections in the event of debtor default. Stresses the practical application of California legal doctrines.

233. Refugee Law Seminar (2) II.

Johnson
 Seminar—2 hours. Focus will be law concerning the admission of refugees into the United States. Detailed study of the Refugee Act of 1980, the major piece of legislation dealing with the admission of refugees into the country, the international law that fueled passage of the Act, and the various regulations promulgated by the Attorney General implementing the law. Analysis of the implementation of the Refugee Act and examination of charges that the immigration bureaucracy is subverting the purpose of the law. Focus on some topical refugee issues.

***234. Family Law Practice (3)**

Seminar—3 hours. Prerequisite: course 225; course 272 recommended concurrently. Combined seminar and clinic to provide marital-legal counseling under

the direct supervision of the instructor. Clinical participation required twice during semester. Students also participate in weekly 2-hour seminar which will cover a wide range of topic areas pertaining to family law practice. Limited enrollment. (S/U grading only.)

235. Administrative Law (3) II.

Gandara
 Discussion—3 hours. State and Federal law related to administrative agencies. Topics include administrative due process, agency adjudication, rulemaking, delegation of authority, standing, and judicial review. Students will become conversant with the Federal Administrative Procedure Act and the 1981 Model State Administrative Procedure Act.

***236. Securities Regulation (3) I.**

Hillman
 Discussion—3 hours. Prerequisite: course 215 or consent of instructor. Focuses on the Securities Act of 1933 and the Securities Exchange Act of 1934. Topics covered include domestic and international public offerings, registration statements, exemptions from registration, secondary offerings, market regulation, liability provisions, the definition of a security, enforcement of the securities act, responsibilities of securities lawyers, and transactional securities fraud. Particular attention is devoted to problems of small issuers of securities.

238. Business Tax (4) II.

Raskind
 Discussion—4 hours. Prerequisite: course 220. The owners of partnerships and subchapter S corporations (pass-through entities) are taxed on items of income, deduction, and loss, as if the owner incurred the item directly. Corporations and shareholders are subject to income tax at both the entity and shareholder levels. This course examines the identity, organization, operation, and dissolution of pass-through entities in terms of the income tax impact of these transactions. Also examined are the formation, capitalization, operation, and liquidation of regular corporations subject to the double tax regime of subchapter C of the Internal Revenue Code.

239. Individual Responsibility and the Law (2) I.

Ayer
 Discussion—2 hours. Consideration of what it is to be a "good lawyer." Issues such as "zealous advocacy," professional detachment, and professional expertise, and the prevailing norms on these topics. Understanding how these norms affect society, the client, and the lawyer. While these are issues of "public policy," we will approach the standpoint of individual choice and responsibility, focusing on ways to reconcile the demands of the profession and one's own demands on oneself. End-of-term "paper" (not a research paper) and there may be several short papers. (S/U grading only.)

240. Elections and Political Campaigns (2) II.

Feeney
 Discussion—2 hours. Course covers constitutional, statutory, administrative and case law aspects of federal and state elections, including laws relating to primaries, general elections, initiatives, recalls, filing requirements, financial disclosures, and conflicts of interest. Satisfies advanced writing requirement. Limited enrollment.

241. Regulated Industry Seminar (2) II.

Fessler
 Seminar—2 hours. The social, political, technological and economic forces implicated in the regulation of traditional public utility industries. Regulated private monopolies that were classically insulated from the pressures of competition are currently being restructured to accommodate and encourage competition at various levels of the supply and distribution chain. As the social contract is altered, the use of public and private monopolies to pursue redistributive social goals is rapidly being undermined by the constraints of competitive market forces and the unwillingness of firms deprived of regulatory protection to provide services that are not cost effective on a stand alone basis. The resulting conflicts pose both substantive and procedural challenges to decision makers and individuals who would act as advocates in an administrative setting. Each student will prepare and present a paper on a topic approved by the instructor. Satisfies advanced legal writing requirement.

242. Conflict of Laws (3) II. Bruch

Discussion—3 hours. Study of transactions with multistate or international contacts. The topics covered include jurisdiction, recognition of foreign judgments, and choice of applicable law. The course deals with problems practitioners frequently encounter in a wide variety of fields, such as commercial law, family law and personal injury law.

243. Bankruptcy (3) II. Ayer

Discussion—3 hours. Survey of the rights and obligations of debtors in trouble, and of their creditors. Most of it concerns proceedings under the Bankruptcy Code. In the first part of the course, an examination of how and why debtors are permitted to get a "fresh start," wiping out their obligations. Later, consideration of how the bankruptcy trustee collects and distributes money to pay creditors' claims. Study of the bankruptcy system as it applies to both individuals and corporations.

244. Basic Human Physiology (2) II. Gray

Discussion—2 hours. Several medical basic science faculty give lectures on the basic anatomy and physiological functioning of the organ systems; basic word roots which underlie medical/scientific terminology are emphasized. Several clinical faculty give lectures on new technologies in medicine and some of the associated legal problems which have arisen. Exams are in the format of simple, simulated medical-legal problems in which students are expected to evaluate medical/scientific data, as well as to determine the kinds of expert witnesses that might be valuable in particular cases. Limited enrollment. (S/U grading only.)

245. Advanced Criminal Law (3) II. Poulos

Seminar—3 hours. Prerequisite: course 227; membership in a "death penalty defense team" (because of the constraints imposed by professional ethics, the seminar must be limited to work on one side of the death penalty cases. This year students may work only on the defense side); attendance at a meeting during the fall semester to finalize enrollment; and consent of instructor. In-depth study of selected death penalty issues focusing on federal constitutional and California law. Students will work on death penalty cases under the supervision of the lawyers handling the cases and instructor. There will be a formal classroom component to the course and a paper is required. The student's work on the case (such as a portion of the brief) will satisfy the paper requirement.

246. Federal Jurisdiction (3) II. Oakley

Discussion—3 hours. Study of the subject matter jurisdiction of federal courts. Constitutional and statutory authority of federal courts to adjudicate civil actions arising under federal law or between parties of diverse citizenship will be examined in contemporary detail, and from the perspective of history and the Constitution. Federal appellate jurisdiction, federal writs in the nature of habeas corpus, abstention, justiciability, and miscellaneous matters affecting attorneys' decisions to seek a federal forum will also be discussed. In addition to careful study of the relevant legislation in light of its history, the course will examine the constitutional themes of separation of powers and federalism as guides to understanding the Supreme Court's leading opinions on the scope of federal jurisdiction.

***247. Advanced Business Tax (3)**

Discussion—3 hours. Prerequisite: course 220 and 238. Continuation of course 238. Focuses on the federal income tax considerations involved in the transfer of business assets including corporate liquidation as an asset acquisition technique, corporate reorganizations, divisive reorganizations, and the transfer of corporate attributes in a reorganization transaction. Also examines tax planning for affiliated groups of corporations.

248. International Law (3) I. Glennon

Discussion—3 hours. Prerequisite: course 217 recommended. This introductory course covers basic international law concepts such as statehood and recognition; treaty law and customary international law; use of force; human rights and war crimes; expropriation; the relationships between international law and national law; and the jurisprudence of international law.

***249. Comparative Law (2)**

Discussion—2 hours. Comparison of methods and sources of common and civil law; background and structure of the principal civil codes; analysis and study of problems arising in international transactions.

250. Jurisprudence (2) I. Oakley

Seminar—2 hours. Course deals with the philosophy of adjudication. Considers the nature of legal interpretation and the relationship between justice and law, with special attention to the problem of how judges should decide hard cases where the content of the law is in doubt. To what extent should a judge's personal convictions about justice affect decisions about the legal rights of the parties to a law suit? Does it matter if the judge is interpreting precedent rather than legislation? Introductory readings of a general and synthetic nature will be followed by a detailed study of particular problems and theories of adjudication. Grading will be based on active class participation and on an original paper. Limited enrollment.

251. Labor Law (3) II. West

Discussion—3 hours. Survey of the legislative, administrative, and judicial regulation of labor relations. Focus on the historical development of labor law, the scope of national legislation, union organization and recognition, the negotiation and administration of collective bargaining agreements, legality of strikes, picketing, boycotts, and employer interference with employee-concerted activities.

252. International Litigation and Arbitration (3) II. Juenger

Discussion—3 hours. Current developments in international law, conflict of laws, civil procedure, arbitration and comparative law in the context of transactions and disputes that cut across national boundaries. Topics covered include jurisdiction, the enforcement of judgments, the relative merits of arbitration and adjudication, international discovery and international choice-of-law problems.

253. Products Liability (3) II. Hogan

Discussion—3 hours. Civil action for harm to the consumer resulting from dangerous and defective products.

254. American Legal History (2) I. Bartosic

Seminar—2 hours. Historical study of the relationship between legal change and social and political movements. Between 1953 and 1969, the Warren Court made enormous changes involving civil rights, civil liberties, criminal procedure, federal-state relations, and legislative apportionment. These legal developments occurred in the midst of the McCarthy period and the Cold War, the civil rights struggle, the anti-war movement, the popularity of folk music and rock and roll, the beginning of the space age, the Great Society legislative program and economic prosperity. What is the relationship between legal change and social and political change? Focus on the modern Civil Rights Movement and assessment of the influence of law, lawyers, lower courts, and the Movement itself on the Court and the elected branches of government. Emphasis on the need to understand law in its social and historical context. Satisfies advanced legal writing requirement. Limited enrollment.

255. Pension and Employee Benefit Law (3) II. Wolk

Discussion—3 hours. Federal regulation and taxation of private pensions and employee benefits. The course will focus on the Employee Retirement Security Act of 1974 (ERISA) and will deal with such topics as coverage, vesting, integration with social security, funding, spousal interests (both during marriage and after divorce), retiree health and welfare plans, and preemption of state law. Fiduciary problems will also be examined, particularly in the area of corporate takeovers and plan investments. Problems surrounding plan terminations will also be considered, including bankruptcy issues. Pension Benefit Guarantee Corporation insurance, and the issue of asset reversions to employers in the case of overfunded plans.

256. Land Use Planning and California Environmental Quality Act (2) I. Taylor

Discussion—2 hours. An assessment of the administrative and judicial applications of land planning and

development. Topics include zoning, general plans, and related environmental and local government regulation. In addition, course will analyze the role of the California Environmental Quality Act and its application to California land use law.

***257. Foreign Relations Law (3)**

Discussion—3 hours. Prerequisite: course 217 or consent of instructor. Seminar covers subjects such as the war power, the treaty power and executive agreements, arms sales and military assistance, the recognition power, the negotiation power, the scope of the appropriations power as a check on executive activities, and other separation-of-powers issues generated by the intersection of international law and constitutional law. Class presentation and required seminar paper will satisfy the advanced legal writing requirement. Limited enrollment.

258. Professional Responsibility (1) II. Perschbacher

Discussion—1 hour. Study of ethical duties and responsibilities under the American Bar Association Code of Professional Responsibility, the Model Rules of Professional Conduct, and the Code of Judicial Conduct. Required of all students for graduation. (S/U grading only.)

259. Feminist Legal Theory Seminar (2) II. The Staff

Seminar—2 hours. Readings selected from the field of feminist legal theory and examination of the relationship between theory and legal practice in support of women's rights. Students required to help lead class discussions and write a research paper, which will satisfy the advanced legal writing requirement. Limited enrollment.

260. Employment Discrimination (3) I. West

Discussion—3 hours. Examination of federal law prohibiting employment discrimination based upon race, color, religion, sex, national origin, age, and sexual orientation. Course will focus on Title VII of the Civil Rights Act of 1964, and include coverage of Art. 1981, Art. 1983, the Equal Pay and Age Discrimination Acts. California fair employment laws will also be discussed.

***261. Local Government (2)**

Seminar—2 hours. Issues arising from two relationships: that between cities and higher levels of government, and that between cities and the people who live within their boundaries. Topics include: 1) state and federal preemption of local laws; 2) state and federal power to restrict cities' freedom of speech; 3) city efforts to control the character of a community; 4) citizens' ability to sue cities for violations of constitutional and federal rights; and 5) citizens' ability to influence city policy through voting. Local antitrust and environmental regulation may also be covered. Class participation and a required original paper will satisfy the advanced legal writing requirement. Limited enrollment.

262. Antitrust (3) I. Gevurtz

Discussion—3 hours. Study of the federal antitrust laws including price fixing, limits on distribution, tying arrangements, monopolization, and mergers.

263. Trial Practice (3) I, II. Fracchia

Discussion—2 hours; laboratory—2 hours. Prerequisite: course 219 (may be taken concurrently). Introduction to the preparation and trial of cases, featuring lectures, videotapes, demonstrations, assigned readings and forensic drills. Laboratory will be held on Tuesday, Wednesday, or Thursday evening. Limited enrollment. (S/U grading only.)

264. Water Law (3) II. Dunning

Discussion—3 hours. Property rights in surface waters, including riparianism, prior appropriation and federal reserved rights; water administration institutions, including the federal reclamation program; the law of interstate waters and property rights in ground water. Emphasis is placed upon California water law and policy.

***265. Natural Resources Law (2)**

Seminar—2 hours. An exploration of the origin, contemporary applications and potential of the public trust doctrine. Limited enrollment.

***266. Wildlife Protection Law (2)**

Seminar—2 hours. Course will encompass federal and state laws directed at wildlife protection, as well as international norms. Required paper will satisfy the advanced legal writing requirement.

267. Civil Rights Law (2) I. Johns

Discussion—2 hours. Survey of federal civil rights litigation. Includes civil remedies for racial discrimination and civil rights violations, specifically actions under: 42 U.S.C.A.s 1981, et. seq.; Title VIII of the Civil Rights Act of 1968; and Title II of the Civil Rights Act of 1964.

***268. Jewish Law Seminar (2)**

Discussion—2 hours. The term "Jewish Law" refers to those subjects that would normally be taught in an American law school as they have been approached by the Jewish legal system. This system is based primarily on the Talmud and on the commentaries and decisions that are derived from it. Jewish law is of interest to American law students not for its immediate practical value, but because it is a foreign legal system that is one of the oldest in the world, and one that has faced many of the problems now facing American law. Specifically, although Jewish law is purportedly based on immutable religious law, changing conditions over the centuries have encouraged methods of adaptation that are reminiscent of American constitutional law. Each student will be required to prepare and present a paper that would fulfill the advanced legal writing requirement. Neither a knowledge of foreign language nor a previous exposure to Jewish law is necessary. Limited enrollment.

269. Basic Finance (3) II. Ayer

Discussion—3 hours. Gives students exposure to basic techniques of valuation that are part of the standard inventory in good business school. Students with a non-law basic finance course will not be admitted, except with consent of instructor.

270. International Business Transactions (2) I. Hillman

Discussion—2 hours. Consideration of select legal problems arising from international business transactions. Topics include the international sales contract, transfers of technology, regulation of bribery, development of joint ventures, repatriation of profits, the General Agreement on Tariffs and Trade, and the regulation of dumping and government subsidies.

271. Insurance Law (2) I. Jordan

Discussion—2 hours. The insurance contract and its evolution; life, property, accident and other risks insured against; construction and enforcement of the various types of policies; statutory and regulatory controls.

272. Family Law (2) II. Bruch

Discussion—2 hours. Emphasizes the legal, social, and emotional aspects of parent-child relationships, including issues concerning medical care, neglect, dependency, abuse, foster care, termination of parental rights, adoption, emancipation of minors, artificial insemination, surrogacy, paternity, surnames, birth control, abortion, child support and child custody. How attorneys, mental health professionals and the judicial process do and should deal with these issues (e.g., interviewing, counseling, and mediation) are also considered.

273. Current Issues in Family and Marital Property (2) II. Bruch

Seminar—2 hours. Prerequisite: course 225, course 230 or 272, or consent of instructor. Examination in depth of important current issues in the fields of family and marital property law. Heavy emphasis on law reform, including study and direct observation of the legislative process. Each student will select one issue for development and presentation in the seminar. A research paper or draft bill and supporting analysis is required. A more lengthy paper with additional unit credit may be arranged with consent of instructor to satisfy the legal writing requirement.

274. Intellectual Property (3) I. Oddi

Discussion—3 hours. Study of the protection of intellectual property and unfair competition. Among the topics considered are trade secrets, patents, trademarks, misleading and false advertising, and copyrights.

275. Complex Litigation (3) II. Johnson

Discussion—3 hours. Study of issues that frequently arise in large, complex litigation involving multiple parties and multiple claims. The class treats in depth topics introduced in the first-year civil procedure course, with emphasis on issues currently being litigated. Topics include complex party joinder, multidistrict federal court litigation, motion practice and sanctions, class actions litigation, discovery and "discovery abuse," including privilege and work product claims, judicial management and settlement of litigation, and preclusion (collateral estoppel and res judicata). Not all topics will necessarily be covered in any one semester.

***276. Juvenile Justice Process (2)**

Discussion—2 hours. Legal and philosophical bases of a separate juvenile justice process; police investigation, apprehension, and diversion; probation intake and detention; juvenile court hearing and disposition; juvenile corrections. Major emphasis is on the role of counsel at each phase of the process. Guest speakers and field trips. Advanced legal writing requirement may be satisfied at the discretion of the instructor.

***278. Pretrial Skills (3)**

Discussion—3 hours. Not open to students who have completed course 297. Course uses a series of role-playing exercises and class discussions to introduce students to a set of non-trial skills basic to the practice of law. The course concentrates on client interviewing and counseling, but will also include exercises in witness interviewing, negotiation, drafting of pleadings, discovery plans, and discovery documents. It is an expanded version of the client counseling course. Limited enrollment.

***279. Public Sector Labor Law (2)**

Seminar—2 hours. Prerequisite: course 251 or consent of instructor. Application of private sector labor law doctrines to the public sector. Emphasis is on the four California public sector statutes and the impact of constitutional law on public employees. Class presentation and seminar paper will satisfy advanced legal writing requirement. Limited enrollment.

***280. Advanced Legal Writing Seminar (2)**

Seminar—2 hours. How to write a variety of legal documents in plain English. Writing exercises and outside readings will be assigned weekly. Each student will complete an individual writing project in lieu of final examination. The writing project will satisfy the law school's advanced legal writing requirements. Limited enrollment. (S/U grading only.)

282. Energy Law (2) I. Gándara

Discussion—2 hours. Prerequisite: course 235. Introduction to regulation of the energy sector. Topics to be covered include regulation of natural monopolies, regulation of electricity and natural gas, legal aspects of the development of conventional and alternative energy sources, and international dimensions of energy development and regulation.

283. Remedies (3) I. Amar

Discussion—3 hours. Study of common law remedies: damages, specific performance, injunctions, and restitutionary relief. Focus of course will be on the efficiency, fairness, and practicality of the alternative remedies available to the practitioner and the court.

***284. Advanced Criminal Procedure (3)**

Discussion—3 hours. Essential to those who wish to handle criminal cases. In particular, it treats bail, prosecutorial discretion, plea bargaining, trial by jury, and sentencing.

285. Environmental Law (3) I. Frank

Discussion—3 hours. Introduction to the law dealing with environmental impact of governmental decisions, particularly the National Environmental Policy Act (NEPA), to the federal and state law on water and air quality, the state and federal law protecting endangered species.

***286. Health Law (2)**

Discussion—2 hours. Course will identify and analyze the myriad legal issues which arise in the dynamic health care industry of the 1990's. Specific focus on the legal implications posed by various business arrangements between providers and payors, from social issues such as AIDS, human reproduction,

and the right to die, to external forces, such as government regulation, and the competitive market place. Course explores many substantive issues, and addresses legal issues posed by the various options presented under the label of "health care reform" and the emerging "integrated delivery system" of the health care industry.

287. Public Land Law (3) I. Dunning

Discussion—3 hours. Legal aspects of federal land management, including the history of public land law, authority over federal lands and specialized law dealing with particular natural resources and uses found on federal lands (minerals, timber, range, wildlife, recreation and preservation).

288. Advanced Constitutional Law Seminar (2) I. Brownstein

Seminar—2 hours; paper. Explores in-depth selected topics or problems in constitutional law and theory. Initial topics will include the regulation of hate speech and the interpretation of the Establishment Clause. Other topics will be selected by the seminar group. Students will be expected to write papers and present them to the seminar. Satisfies advanced legal writing requirement. Limited enrollment.

289. Toxics Law (2) II. Dunning

Discussion—2 hours. Government efforts to assess and manage environmental risk, to regulate the release of toxic chemicals to the environment and to clean up existing toxic dump sites are studied, as well as actions to recover for personal injury and/or property damage for such releases (environmental "toxic torts").

***290. International Environmental Law (3) II. Glennon**

Seminar—3 hours. Prerequisite: course 248. Problem-oriented seminar will focus on current issues concerning the protection of international environment, including global warming, biodiversity, endangered species, cultural and historical heritage, ocean dumping and related topics. Will satisfy the advanced legal writing requirement.

291. International Trade Law and Latin American (3) II. Smith

Discussion—3 hours. Covers the role of the executive, legislative and judicial branches of the United States with respect to international trade policy. International topics include the World Trade Organization (WTO) and the General Agreement on Tariffs and Trade Agreements (GATT, 1947), the GATT, 1994, North American Free Trade Agreement (NAFTA) and economic integration in this Western Hemisphere. Students are encouraged to do supervised research on selected topics of trade law and Latin America. Satisfies the advanced legal writing requirement.

292. Immigration Law and Procedure (3) I. Smith

Discussion—3 hours. Course will survey a brief history of U.S. immigration and policy; federal agency inter-relationship (Justice and State Department); entry of nonimmigrant (temporary) visitors and immigrants into the United States; the worldwide quota and preference systems; family and employment relationship critical to securing favored immigrant status; deportation procedures; discretionary relief available to persons otherwise subject to deportation; available defenses to deportation and exclusion proceedings; immigration consequences of criminal conviction; refugee and asylum law; administrative appeals; federal and state judicial relief; citizenship and naturalization.

293. Public Interest Law Seminar (2) II. G. Smith

Seminar—2 hours. Examines the problems associated with providing legal services to those people and interests in American society traditionally unable to afford those services. The class will discuss selected readings that review various theoretical issues and specific problems facing public interest lawyers. May satisfy advanced legal writing requirement. Limited enrollment.

***294. Problems in Fiduciary Administration (2)**

Seminar—2 hours. Prerequisite: course 221. Selected topics in the area of fiduciary administration of estates and trusts. Required class presentation and research

paper will satisfy the advanced legal writing requirement. Limited enrollment.

***295. Securities Regulation II (2)**

Discussion—2 hours. Prerequisite: course 213 or 215, or consent of instructor; course 236 recommended. Principal focus is the Securities Exchange Act of 1934 and the regulation of securities markets. Topics include the evolution of securities markets, market efficiency, continuous reporting, institutional investors, shareholder voting and going-private transactions, regulation of securities markets and securities professionals, responsibilities of securities lawyers, transactional securities fraud, and enforcement of the securities acts.

296. Copyright and Entertainment Law (3) II. Kurtz Discussion—3 hours. Most of course will involve a detailed consideration of the law of copyright, with emphasis on its application to motion pictures, music, television, and theater. The rest of course will involve a study of other legal problems in the entertainment industry, including misappropriation, protection of titles, characters, group names, slogans, and the rights of privacy and publicity.

297. Dispute Resolution and Lawyers (2) II. Smith Discussion—2 hours. Students who have taken course 278 or 209 or 211 cannot enroll in this course. Course uses a series of role-playing exercises and class discussions to introduce students to a set of non-trial skills basic to the practice of law. Exercises include interviewing, counseling, negotiations, arbitration and mediation. Limited enrollment.

298. Group Study (1-4) I, II. The Staff Groups of students (not fewer than 4 or more than 10) with common interest in studying a stated legal problem may plan and conduct their own research and seminar program, subject to the following regulations: (1) the program may extend over no more than two semesters; (2) the plan for the program and the list of members of the group must be submitted to Dean's Office at least 4 weeks prior to opening of the semester in which the program is to begin; (3) the three-member faculty board will be appointed for each group proposed and will have authority to approve or disapprove the program and the amount of credit sought; (4) changes in the program or in membership of the group must be approved by the faculty board and normally will be approved only prior to the semester involved; (5) group members must conduct a weekly seminar session to be arranged by them; (6) each member of the group must submit an individual paper or an approved alternative growing out of the seminar subject to the faculty board; (7) S/U grading basis only unless the entire group requests letter grades in advance.

299. Research in Legal Problems (1-4) I, II. The Staff

Students may receive credit for individual research projects, subject to the following regulations: (1) the project may extend over no more than two semesters; (2) each project will be under the supervision of a faculty member; (3) an outline of the project must be approved by the supervising faculty member in advance of the semester in which it is to be undertaken; (4) normally, no faculty member will be permitted to supervise more than five students working on individual programs during any semester; (5) each student must submit an individual paper or approved alternative to the supervising faculty member. (S/U grading only.) In exceptional cases, with prior approval of a professor and an associate dean, students may arrange for directed research in foreign and/or international legal problems by working abroad under the supervision of a UC Davis Law School faculty member and an attorney or faculty member at a foreign or international government agency or educational institution (4 up to 12 units).

Professional Courses

410A. Appellate Advocacy (Moot Court) (1) I.

Program includes classroom instruction in appellate procedure and appellate advocacy skills and participation in the moot court program. Participants in 410A work on three oral advocacy problems and argue six times before a moot court. Both courses, 410A and

410B, must be taken in order to qualify for interschool competitions. Limited enrollment. (S/U grading only.)

410B. Appellate Advocacy (Moot Court) (1) II.

Prerequisite: course 410A. Continuation of course 410A. Participants in 410B research and write an appellate brief and argue the case twice before a moot court. Both courses, 410A and 410B, must be taken in order to qualify for interschool competitions. Limited enrollment. (S/U grading only.)

412. Carr Intraschool Trial Advocacy Competition (1) I. The Staff

Competition—1 hour. Named after the late Justice Frances Carr, this competition is open to second- and third-year students. A preliminary round is followed by quarter-finals, semi-finals, and a final round. Students participate in mock trials presided over by judges and critiqued by experienced litigators. Limited enrollment. (S/U grading only.)

413. Interschool Competition (1-3) I, II. The Staff Prerequisite: consent of appropriate faculty adviser. Participation in interschool moot court and lawyering skills competitions. Enrollment is limited to students actually representing the School in the interschool competitions. Competition must be authorized by the appropriate faculty adviser. The faculty adviser may condition the award of academic credit for any particular competition on the performance of such additional work as may be reasonable to justify the credit. May satisfy advanced legal writing requirement. (S/U grading only.)

414. Moot Court Board (1) I, II. The Staff

Prerequisite: course 410A-410B. Members of Moot Court Board may receive one credit for each semester of service on the board, up to maximum of two. Credit awarded only after certification by Moot Court Board and approval of the faculty advisers to Moot Court Board. Limited enrollment. (S/U grading only.)

415. Trial Practice Honors Board (1) I. The Staff

Members of the Trial Practice Honors Board administer the Frances Carr competition. Members are nominated by their individual Trial Practice I adjuncts. Students receive one credit for serving on the Board, awarded upon approval of the faculty adviser. (S/U grading only.)

416. Law Review Writer (1-2) I and/or II.

Writing of an editorship quality law review article under the editorial supervision of editors of the *Law Review*. Minimum of 40 hours contribution to the *Review's* publication is also required. Credit may be obtained only upon achieving status as a member of the *Law Review*, which requires that the student have made substantial progress toward completing an editorship article. Credit is awarded only after certification by the Editor-in-Chief of the *Law Review* and approval of the faculty advisers to the *Law Review*. One unit of credit is earned the first semester. Two units are earned the second semester upon completing an editorship draft. One unit is earned second semester if only a membership draft is completed. (S/U grading only.)

417. Law Review Editor (2) I, II. The Staff

Editors must have completed an editorship article and must perform editorial duties requiring a substantial time commitment. Credit awarded only after certification by the Editor-in-Chief of the *Law Review* and approval of the faculty advisers to the *Law Review*. Students may receive four credits over two semesters for service as an editor. [In exceptional cases, students may petition to participate for one semester only and receive two credits.](S/U grading only. Deferred grading pending completion of sequence.)

418. Environs Editor (1) I, II. Dunning

The Editor-In-Chief of *Environs* receives one credit for each semester of service. Only one person may receive this credit in any one semester. (S/U grading only.)

419. Advanced Writing Project (1-4) I, II. The Staff

Completion of a writing project under the active and regular supervision of a faculty member in satisfaction of the legal writing requirement. Writing project must be an individually authored work of rigorous intellectual effort of at least 20 typewritten, double-spaced pages, excluding footnotes. Project may take any of

several forms, for example, a paper, a brief, a memorandum of law, a proposed statute, a statutory scheme or set of administrative regulations (with explanatory comments), or a will or agreement (with explanatory comments). Advanced writing project may also be undertaken in connection with another course or seminar to satisfy the legal writing requirement. Number of units for the writing project shall be approved by the faculty supervisor and will depend upon the scope of the writing effort. (Grading may be on S/U or letter-grade basis at the faculty supervisor's discretion.)

420. Civil Rights Clinical Program (2 to 6 or 12) I. Johns

Clinical Program. Prerequisite: prior or concurrent enrollment in course 267 and 219. Provides practical experience in providing legal services to indigent clients who have filed civil rights actions in the United States District Court for the Eastern District of California. Students will work on clinic cases under the supervision of the clinic director and supervising attorney. (S/U grading only.)

425. Judicial Clinicals (2 to 6 or 12) I, II. Jordan Clinical Program. Prerequisite: relevant substantive and procedural courses recommended. Students may arrange individual judicial clerkship clinical programs with state and federal judges of their choice with the approval of the Clinical Committee and under the sponsorship of individual faculty members. An introductory orientation seminar is required. Otherwise, the requirements for the program are the same as for Individual Clinicals (course 420). (S/U grading only.)

430. Clinical Program in Federal Taxation (2-6) I, II. Simmons

Clinical—2-6 hours. Prerequisite: course 220. Students will have the opportunity to work with the Internal Revenue Service or other governmental tax agency. Journals and attendance at group meetings are required. (S/U grading only.)

440. Immigration Law Clinic (2 to 6 or 12) I, II. Smith

Clinical Program. Students may represent clients in administrative law hearings in San Francisco. Minimum units for the course are 4 and maximum is 12. Each unit assumes four hours work per week, including participation in the seminar, conference, and case research and development. Students who have completed course 292 may take the clinic for a minimum of 2 units. Limited enrollment. (S/U grading only.)

445. Legislative Process Clinical (2-4)

Clinical Program. Prerequisite: prior or concurrent enrollment in course 231 or 210, or consent of instructor. Provides students with practical experience in the operation of the office of a legislator or a legislative committee. The major thrust of the program is to enable students to become familiar with the give and take realities of making laws, as contrasted with their interpretation and enforcement. Journals are required. (S/U grading only.)

450. Environmental Law Clinical (2-6) II. Dunning Clinical Program. Practical experience in environmental law. Students will work under the direct supervision of a government or private lawyer engaged in some form of environmental law work for a minimum of 8 office hours per week. Students will also be required to prepare a bi-weekly journal, noting, commenting upon, and reflecting upon their clinical experience. (S/U grading only.)

455. Clinical Program in Employment Relations (2 to 6 or 12) I, II. West

Clinical Program. Prerequisite: prior or concurrent enrollment in course 251 or 260 or consent of instructor. Practical experience in employment relations: private and public sector labor law, or employment discrimination. Students will work under the direct supervision of a government or private lawyer and will have the opportunity to participate in a range of activities associated with their specific office, with emphasis on observation and participation in actual investigation, interviewing, drafting of pleadings, and attendance at hearings. Weekly journals and attendance at monthly small group meetings required. (S/U grading only.)

460. Public Interest Clinical (2-6) I, II. West
Clinical program. Prerequisite: completion or concurrent enrollment in course 293 recommended. Students work with a public interest practitioner in a nonprofit organization. Journals and attendance at two group meetings are required. Clinical students must complete an evaluative final paper of approximately 8 pages. Hours completed in public interest setting may be applied toward the practicum requirement for the Public Interest Law Program. (S/U grading only.)

***465. Clinical Program in Administrative Law** (2-6) I, II. Gandara
Clinic—2-6 hours. Prerequisite: course 235 (may be taken concurrently) or consent of instructor. For students interested in a work experience in an administrative law setting. Students will work under the direct supervision of an administrative law judge, hearing officer, or government attorney. Placement assistance will be provided by the instructor. A goal of this clinical will be a breadth of experience in the areas of formal adjudication, informal adjudication, rulemaking, and judicial review. Students will be required to meet monthly as a group to share experiences and maintain observational journals. (S/U grading only.)

470. Clinical Program in the Administration of Criminal Justice (2 to 6 or 12) I, II. Feeney
Clinical program. Prerequisite: courses 219, 227 and 263A recommended. This program affords students the opportunity to gain practical experience working full- or part-time in a District Attorney's or Public Defender's office in one of several surrounding counties for a minimum of 13 office hours per week. Students enrolled in the program engage in the full range of activities associated with their specific office with emphasis on observation and participation in factual investigation, interviewing, counseling, negotiating, motion practice, and trials under State Bar rules. Journals and seminar attendance are required. Limited enrollment. May be repeated for a total of 12 units. (S/U grading only.)

480. Clinical Program in Prison Law (2-6) I, II. Murphy
Clinical Program. Provides practical experience in providing legal services to real clients who have various problems related to their incarceration in state prison. The services require analysis and application of Constitutional Law, state statutory law, agency regulations, and the rules of professional responsibility. Students will work under the direct supervision of the Prison Law clinical director and will be assigned a portion of the director's case load. Students will be required to follow the law office procedure of the clinic and employ skills such as interviewing, research, writing, negotiating, and possibly, the preparation of legal documents to be filed in court. (S/U grading only.)

495. Instruction in Legal Research and Legal Writing Skills (1-2) I. Bernhard; II. Bernhard, Johns
Participants will assist in instructing legal research and writing for first-year students under the direction of the legal research and writing instructors. Approval of the research and writing instructors is required for enrollment. Participants may assist once in the legal research program and once in the legal writing program. One unit will be given in the fall semester for legal research instruction and two units in the spring for legal writing instruction. (S/U grading only.)

Martha Macri, Ph.D., (Anthropology, Native American Studies)

Maria I. Manoliu-Manea, Ph.D. (French)
Almerindo E. Ojeda, Ph.D. (Linguistics)
Mary Schleppegrell, Ph.D., (Linguistics)
Lenora A. Timm, Ph.D. (Linguistics)
Máximo Torreblanca, Ph.D. (Linguistics)

Faculty

Wilbur A. Benware, Ph.D., Professor
Diane Brentari, Ph.D., Assistant Professor
Nina F. Dronkers, Ph.D., Assistant Adjunct Professor
Patrick Farrell, Ph.D., Assistant Professor
Jeffrey King, Ph.D., Associate Professor (Philosophy)
Steven G. Lapointe, Ph.D., Associate Professor
Debra L. Long, Ph.D., Assistant Professor (Psychology)

Martha Macri, Ph.D., Assistant Professor (Anthropology, Native American Studies)

Maria I. Manoliu-Manea, Ph.D., Professor (French)
Barbara J. Merino, Ph.D., Associate Professor (Education)

Almerindo E. Ojeda, Ph.D., Associate Professor
Winfried Schleiner, Ph.D., Professor (English)
Mary Schleppegrell, Ph.D., Assistant Professor
Janet S. Smith, Ph.D., Associate Professor (Anthropology)

Lenora A. Timm, Ph.D., Professor
Máximo Torreblanca, Ph.D., Professor
Carolyn F. Wall, Ph.D., Lecturer (Anthropology)
Karen A. Watson-Gegeo, Ph.D., Professor (Education)

Aram Yengoyan, Ph.D., Professor (Anthropology)

Emeriti Faculty

David L. Olmsted, Ph.D., Professor Emeritus
Benjamin E. Wallacker, Ph.D., Professor Emeritus
Gwendolyn Schwabe, M.A., Senior Lecturer Emerita

The Major Program

The discipline of linguistics encompasses a broad spectrum of knowledge about human language. Linguistics focuses on theories of language, description of contemporary languages, and the study of language change through time. It also has important applications within many other disciplines such as anthropology, biology, communications, education, language teaching, literature, philosophy, psychology, and sociology.

The Program. An introductory lower division course provides students with basic concepts and some of the methods needed to analyze language in a systematic way. Upper division courses probe more deeply into specific aspects of language structure, language use, and the relationship of language to other realms of human activity.

Career Alternatives. Majors in linguistics find practical outlets for their linguistic training in various areas of employment: for example, in the computer science industry; in teaching English as a second language; in foreign language teaching; in elementary and secondary level bilingual-bicultural programs; in missionary work; in bilingual-bicultural curriculum development (for example, in publishing houses); in legal work; in speech therapy; or as lexicographers (for dictionaries). All these types of employment share an interest in persons skilled in the analysis of language, spoken and/or written—linguistics equips its students with just such skills.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	4-24
Linguistics 1	4
Foreign language, one course beyond the 15-unit requirement of the College of Letters and Science in the same language used to fulfill the college requirement.....	0-20
Depth Subject Matter	48
Linguistics 102, 109, 120, 139, 140, 142, 164, 165	32
Linguistics 170 or 172	4
At least 12 upper division units from the following courses:	12

*Course not offered this academic year.

Any other Linguistics course not included in the 32-unit requirement above, Anthropology 111, 112, 113, 114, 117, 118, 119, 120, Education 117, 118, 151, English 105A, 105B, 107, French 160, 161, German 105, 106, 107, 108, Human Development 101, Philosophy 137, Psychology 132, Rhetoric 105, 107, Russian 160, Spanish 111N, 112N, 113, 114N.

The student should note that a number of these courses have prerequisites. Since it is usual to select some emphasis within the Linguistics major (e.g., anthropology, a foreign language, etc.) such prerequisites should be completed as a matter of course.

Total Units for the Major.....**52-72**

Major Adviser. P. Farrell.

Minor Program Requirements:

The minor in Linguistics is designed to provide the student with a basic knowledge of linguistic analysis. It would be appropriate for students interested in any aspect of language use.

UNITS

Linguistics.....**24**

Linguistics 1, 109, 139, and 140.....16
Additional units of upper division Linguistics courses, chosen in consultation with an adviser.....8

Minor Adviser. Same as Major adviser.

Graduate Study. The Linguistics Graduate Group offers study and research leading to the M.A. degree. Detailed information may be obtained from the Graduate Adviser or from the Chairperson of the Linguistics Group.

Graduate Adviser. A.E. Ojeda.

Courses in Linguistics (LIN)

Lower Division Courses

1. Introduction to Linguistics (4) I, II, III. Brentari, Farrell, Timm, Benware, Lapointe, Ojeda
Lecture—3 hours; discussion—1 hour. Introduction to the study of language; its nature, diversity, and structure. General Education credit: Civilization and Culture.

10. Elementary American Sign Language (5) I. The Staff
Recitation—4 hours; discussion—1 hour. Prerequisite: course 1 recommended. Introduction to American Sign Language grammar and vocabulary, with emphasis on conversational skills.

11. Elementary American Sign Language (5) II. The Staff
Recitation—4 hours; discussion—1 hour. Prerequisite: course 10. Continuation of course 10.

12. Elementary American Sign Language (5) III. The Staff
Recitation—4 hours; discussion—1 hour. Prerequisite: course 11. Continuation of course 11.

***13. Intermediate American Sign Language** (5) I. The Staff
Recitation—4 hours; discussion—1 hour. Prerequisite: course 12. Grammar review and vocabulary development; enhancement of conversational skills.

***14. Intermediate American Sign Language** (5) II. The Staff
Recitation—4 hours; discussion—1 hour. Prerequisite: course 13. Emphasis on classifier and numeral systems in American Sign Language; conversational practice.

***15. Advanced American Sign Language** (5) III. The Staff
Recitation—4 hours; discussion—1 hour. Prerequisite: course 14. Study of American deaf culture through conversation and narratives; dialects of American Sign Language; deaf education.

Linguistics

(College of Letters and Science)

Steven G. Lapointe, Program Director
Program Office, 922 Sproul Hall (916-752-9933)

Committee in Charge

Wilbur A. Benware, Ph.D. (Linguistics)
Diane Brentari, Ph.D. (Linguistics)
Patrick Farrell, Ph.D. (Linguistics)
Steven G. Lapointe, Ph.D. (Linguistics)

20. Oral English for Undergraduate ESL Students (3) III. The Staff (Lowry in charge)

Lecture/discussion—3 hours. Prerequisite: consent of instructor; limited primarily to students who have fulfilled their Subject A requirement or have completed course 23. Intensive practice in oral English for undergraduate ESL students. Students will learn to identify and modify features of their pronunciation which limit their ability to communicate clearly. Students will also learn and practice strategies for effective participation in academic tasks. (P/NP grading only.)

21. Introduction to Reading and Composition for Non-Native Speakers (5) I, II. The Staff (Lowry in charge)

Lecture/discussion—5 hours. Prerequisite: admission by placement examination only. Provides undergraduate students whose native language is not English with intensive work in reading and in writing organized, coherent, and grammatically correct paragraphs and short academic essays. (Former course English 21.) (P/NP grading only.)

22. Intermediate Reading and Composition for Non-Native Speakers (4) I, III. The Staff (Lowry in charge)

Lecture/discussion—4 hours. Prerequisite: admission by placement examination or by successful completion of course 21. Provides undergraduate students whose native language is not English with experience in writing essays in recognized rhetorical modes. Students will also read to develop fluency and critical thinking and will study grammar needed for academic writing. (Former course English 22.) (P/NP grading only.)

23. Advanced Reading and Composition for Non-Native Speakers (4) I, II, III. The Staff (Lowry in charge)

Lecture/discussion—4 hours. Prerequisite: admission by placement examination or by successful completion of course 22. Provides undergraduate students whose native language is not English with experience writing persuasive essays related to reading passages. Students will also read for tone, style, context, and assumptions and will study advanced grammar needed for persuasive essays. (Former course English 23.) (P/NP grading only.)

25. English for International Graduate Students I (5) I, II. The Staff (Lane in charge)

Lecture—3 hours; laboratory—6 hours. Prerequisite: admission by placement examination; admission limited to international graduate students and limited status (international) undergraduate students. Develops skills needed for studying on the graduate level: note-taking on lectures and on written academic material, writing logically and accurately under time pressure, giving oral presentations, systematically extending vocabulary, and writing a research paper. May be repeated for credit with consent of coordinator. (Former course English 25) (P/NP grading only.)

26. Writing for International Graduate Students (3) II. The Staff

Lecture—3 hours. Prerequisite: satisfactory completion of course 25 if held for it, or consent of instructor. Admission limited to international graduate students. Focuses on writing needed for academic work, including summaries, critiques, research and grant proposals, memos, resumes, and research papers. Includes a review of grammar needed for writing and some focus on reading skills and American vocabulary and idioms. (P/NP grading only.)

50. Languages of the World (4) II. Benware, Timm
Lecture—3 hours; discussion/laboratory—1 hour. Prerequisite: course 1 or Anthropology 4 recommended. Survey of the world's languages, their classification, distribution, and interrelationships; structural similarities and differences; accounts of the origin of human languages; sign languages, pidgin/creoles, "universal" languages, endangered languages, and languages of global significance. General Education credit: Civilization and Culture.

98. Directed Group Study

(1-5) I, II, III. The Staff (Director in charge)
Prerequisite: consent of instructor. Intended for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates

(1-5) I, II, III. The Staff (Director in charge)
Prerequisite: consent of instructor. Intended for lower division students. (P/NP grading only.)

Upper Division Courses**102. Historical Linguistics** (4) III. Benware

Lecture—3 hours; discussion—1 hour. Prerequisite: course 139. Description and methods of the historical study of language; sound change, morphological change, syntactic change, semantic change.

109. Phonetics (4) I. Brentari

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Introduction to articulatory phonetics with some attention to the fundamentals of acoustic phonetics.

113. Language, Gender and Society (4) II. Timm

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Investigation of real and putative (stereotyped) sex-linked differences in language structure and usage, with a consideration of some social and psychological consequences of such differences. Focus is on English, but other languages are also discussed. General Education credit: Contemporary Societies.

115. Chicano Sociolinguistics (4) I. Timm

Lecture—3 hours; term paper. Prerequisite: course 1 and Spanish 3, or the equivalent. Topics covered include the linguistic features of Chicano Spanish, Spanish-English code-switching, regional and social diversity in Chicano Spanish, Chicano English, the acquisition of bilingualism, language choice and use, attitudes about Spanish and English, Spanish language maintenance and shift, Chicano bilingualism and education. Offered in alternate years.

116. The Spanish Language in the United States

(4) III. Torreblanca
Lecture—3 hours; term paper. Prerequisite: Spanish 23 or the equivalent, and course 1 or Spanish 132. Linguistic features of the varieties of the Spanish language spoken throughout the United States: phonology, morphology, syntax, vocabulary. The main focus is the relationship between United States Spanish and other world varieties of Spanish, within a historical framework.

120. Semantics (4) I. Ojeda

Lecture—3 hours; term paper. Prerequisite: course 1 or consent of the instructor. Introduction to the study of meaning: the nature of the linguistic sign, the structure of the lexicon, and the semantics of sentences.

***135. Introduction to Psycholinguistics** (4) III. Lapointe

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; courses 139, 140 recommended. Introduction to psychological issues relating to language and to the implications of research in psychology for linguistic theory.

138. Language Development (4) II. Lapointe

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of the instructor. Theory and research on children's acquisition of their native language including the sound system, grammatical structure, basic semantic categories, and social aspects of usage.

139. Phonological Analysis (4) II. Brentari

Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. Introduction to and application of phonological theory.

140. Grammatical Analysis (4) I. Farrell, Lapointe

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Introduction to syntactic analysis; survey of types of syntactic and semantic phenomena in natural languages. Emphasis will be on developing skills and data analysis, rather than on investigating formal aspects of the theoretical framework to be employed.

142. Morphology (4) III. Lapointe, Farrell

Lecture—3 hours; discussion—1 hour. Prerequisite: course 139, 140. Introduction to the analysis of word structure and the relation of word structure to the lexicon and other grammatical components.

164. Introduction to Phonological Theory (4) III. Brentari

Lecture—3 hours; discussion—1 hour. Prerequisite: course 139. Introduction to contemporary phonological theory, with emphasis on autosegmental, metrical, and lexical theory.

165. Introduction to Syntactic Theory (4) II. Farrell, Lapointe

Lecture—3 hours; discussion—1 hour. Prerequisite: course 140. Introduction to syntactic theory, primarily through the detailed study of a major theory of syntax, emphasizing theoretical reasoning, argumentation and theory building

***169. Current Theories of Syntax** (4) III. Ojeda, Farrell, Lapointe

Lecture—3 hours; discussion—1 hour. Prerequisite: course 165. Examination of major contemporary theories of syntax.

***170. Language Universals and Typology** (4) II. The Staff

Lecture—3 hours; term paper. Prerequisite: course 165 (may be taken concurrently). Investigation into common features of all human languages and the classification of languages in terms of their structural features; theories of universal grammar; detailed discussion of a non-Indo-European language and comparison with English.

172. Language Structures (4) II. The Staff

Lecture—3 hours; term paper. Prerequisite: courses 102, 139, 140. In-depth study of the structure of a particular language or members of a language family or area. May be repeated for credit.

175. Biological Basis of Language (4) III. Dronkers

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Overview of issues in the field of neurolinguistics and techniques used to explore representation of language in the human brain.

192. Internship in Linguistics (1-12) I, II, III. The Staff (Timm in charge)

Internship—3-36 hours; two written reports. Prerequisite: course 1 or the equivalent. Internship applying linguistic-related skills to a fieldwork project in areas such as media, law, or industry, in approved organizations or institutions. Maximum of 4 units applicable toward major. (P/NP grading only.)

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (Director in charge)

Individual study—1-5 hours. Prerequisite: open only to linguistics majors of senior standing who qualify for honors program. Guided research, under the direction of a faculty member approved by the Program Director, leading to a senior honors thesis. (P/NP grading only.)

197T. Tutoring in Linguistics (1-4) I, II, III. The Staff (Chairperson in charge)

Discussion—1-4 hours. Prerequisite: upper division standing, consent of instructor, and consent of department chairperson. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: senior standing in Linguistics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates

(1-5) I, II, III. The Staff (P/NP grading only.)

Graduate Courses***202. Principles of Historical Linguistics** (4) I. Manea-Manoliu

Lecture—3 hours; term paper. Prerequisite: course 102. Advanced treatment of the theory and methods of historical linguistics. Offered in alternate years.

209. Advanced Phonetics (4) II. Brentari

Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. Exploration of the physiological basis of speech articulation and an introduction to acoustic phonetics. Offered in alternate years.

210. Advanced Semantic Theory and Analysis (4)

II. Ojeda
Lecture—3 hours; term paper. Prerequisite: course 120, 140. Advanced critical exploration of contemporary theories of linguistic semantics. Offered in alternate years.

220. Romance Linguistics (4) I. Manea-Manoliu
Seminar—3 hours; term paper. Prerequisite: one course from the following: courses 102, 139, 140. The development of the major Romance languages from Proto-Romance to the modern era. Selected topics in the structure of modern Romance languages. Option of focus on phonology, syntax, or historical linguistics. Offered in alternate years.

***225A. Modern Linguistic Theory: Structuralism**

(4) II. Manea-Manoliu
Lecture—3 hours; term paper. Prerequisite: courses 139, 140. Survey of the development of structural linguistics from deSaussure to the 1950s. Offered in alternate years.

***225B. Modern Linguistic Theory: Generative Grammar**

(4) III. Ojeda
Lecture—3 hours; term paper. Prerequisite: courses 139, 165. Survey of the development of generative grammar and its offshoots from the 1950s to the present. Offered in alternate years.

***239. Advanced Phonological Theory and Analysis (4)**

III. Brentari
Lecture—3 hours; term paper. Prerequisite: course 139. Critical overview of current phonological theories. Offered in alternate years.

250A-250B-250C-250D. Topics in Linguistic Theory and Methods (4-4-4-4) I, II, III. The Staff
Seminar—3 hours; paper. Prerequisite: graduate standing and consent of instructor. Introduction to current research in various aspects of linguistics.

265. Advanced Syntactic Theory and Analysis (4)

III. Farrell
Lecture—3 hours; term paper. Prerequisite: course 165. Critical survey of contemporary theories of syntax, with concentration on functionalist theories. Offered in alternate years.

280. Theory of English as a Second Language (4)

I. The Staff
Lecture—3 hours; term paper. Theoretical issues that have influenced the teaching of English as a second language. Contributions of collateral disciplines—psycholinguistics, sociolinguistics, and cognitive psychology—to English as a second language instruction.

281. Research on Second Language Acquisition

(4) II. Merino
Lecture—2 hours; laboratory—1 hour; term paper; computer projects. Prerequisite: upper division or graduate standing. Analysis of theory/research on L2 acquisition. Topics include: contrast of L1/L2 acquisition; current theories of L2 such as the natural order and input hypotheses, as well as effects of individual variation, cognition, motivation on L2; research design and basic statistical analyses.

282. Individual and Social Aspects of Bilingualism (4)

III. Timm
Lecture—3 hours; term paper. Broad overview of bi- and multilingualism, with focus on theoretical and descriptive research; topics covered range from language processing in bilinguals to code-switching to language as political issue in multilingual states.

297T. English as a Second Language Teaching/Tutoring (1-4)

I, II, III. Schleppegrell
Tutoring—1-4 hours. Prerequisite: course 300, 301, or 302 (may be taken concurrently). Teaching classes for ESL graduate students. Aiding the ESL undergraduate composition classes; tutoring foreign graduate student Teaching Assistants in pronunciation. Does not fulfill requirement toward the M.A. degree. May be repeated for credit. (S/U grading only.)

298. Directed Group Study (1-5)

I, II, III. The Staff
(Chairperson in charge)
Prerequisite: graduate standing. (S/U grading only.)

299. Research (1-12)

I, II, III. The Staff
(S/U grading only.)

Professional Courses**300. The Teaching of English as a Foreign Language (4)**

I. Schleppegrell
Lecture—3 hours; laboratory—3 hours. Prerequisite: English 105A or course 109 or consent of instructor. Methods of teaching English to nonnative speakers, stressing particularly recent linguistic methodology and techniques.

301. Materials of TESOL (4)

II. Schleppegrell
Lecture—4 hours. Prerequisite: course 300 or consent of instructor. Designing and evaluating ESL curricula and proficiency assessment instruments in all areas of language acquisition (pronunciation, reading, listening comprehension, etc.). Developing lessons, teaching and tutoring in selected language acquisition areas in the UCD ESL clinic. Evaluating (and adapting) published ESL materials.

302. Recent Research and Special Projects in TESOL (4)

III. Schleppegrell
Lecture—4 hours. Prerequisite: course 300 and 301. Review of recent research in second language acquisition and the teaching of English to speakers of other languages. Continued teaching and tutoring in the UCD ESL clinic. Each student also designs and reports on a classroom research project.

391. Oral English for ESL Students (3)

II, III. The Staff
Lecture—2 hours; laboratory—2 hours. Prerequisite: open only to non-native speakers of English students with priority enrollment to international student teaching assistants; completion of any required ESL courses or consent of instructor. Course gives non-native English-speaking students, particularly international student teaching assistants, intensive work in oral English to increase fluency, accuracy, and use of appropriate discourse strategies in academic settings (e.g., seminar, discussion, laboratory). Course may be repeated for credit with consent of coordinator. (S/U grading only.)

Linguistics (A Graduate Group)

Steven G. Lapointe, Ph.D., Chairperson of the Group
Group Office, 922 Sproul Hall (916-752-9933/1219)

Faculty. The Group includes faculty from eight departments in the College of Letters and Science.

Graduate Study. The Graduate Group in Linguistics offers a program of study leading to the M.A. degree. There are two tracks within the program, one concentrating on applied linguistics and TESOL, and the other on general linguistics. Within the general linguistics track, the following areas are emphasized: (a) grammatical analysis and theory in syntax, morphology, semantics, and phonology, (b) sociolinguistics, (c) psycholinguistics and neurolinguistics, and (d) linguistic description (contemporary or historical) of a particular language or group of languages.

In general, the M.A. in Linguistics at UCD is intended to serve as preparation for advanced graduate work at the Ph.D. level, as a supplement to studies in related fields—especially anthropology, psychology, philosophy, the various languages—or as a major component in the training for a professional career (such as TESOL, speech therapy, and foreign language teaching). The program is structured so as to place considerable emphasis on interdisciplinary studies, thereby increasing the breadth of the candidate's knowledge, and providing a wider and more flexible variety of options to pursue thereafter.

Preparation. Applicants to the M.A. program who do not have a bachelor's degree in Linguistics must complete the following courses in Linguistics from the undergraduate program: 109 (phonetics), 102 (historical linguistics), 120 (semantics), 139 (phonological analysis), 140 (grammatical analysis), and 165 (introduction to syntactic theory).

Requirements. The requirements for the two tracks differ. The track in general linguistics falls under the Plan I set of requirements. Thirty units of upper division and graduate course work above and beyond the prerequisite courses listed under Preparation (above) must be completed, and a thesis is required. The track in applied linguistics and TESOL operates under either Plan I or Plan II. The Plan I requirements are the same as those listed above. Under Plan II, thirty-six units of upper division and graduate course work above and beyond the prerequisite courses are required, and at the end of the course work a student must pass a written comprehensive examination. Students in both tracks must pass a foreign language reading examination.

Graduate Adviser. A.E. Ojeda (*Linguistics*).

Literature in Translation

The following courses are open to students throughout the campus. The readings can be in English. Refer to departmental listing for the course description.

Chinese

- *10. Modern Chinese Literature (in English)
- 11. Great Books of China
- 50. Introduction to the Literature of China and Japan
- 104. Twentieth-Century Chinese Fiction (in English)
- *105. Western Influences on Twentieth-Century Chinese Literature (in English)
- 106. Chinese Poetry (in English)
- *107. Traditional Chinese Fiction (in English)
- *108. Poetry of China and Japan (in English)
- *109A-I. Topics in Chinese Literature (in English)
- 110. Great Writers of China: Texts and Context (in English)

Classics

- 140. Homer and Ancient Epic
- *141. Greek and Roman Comedy
- *142. Greek and Roman Novel
- *143. Greek Tragedy

Comparative Literature

- 1. Great Books of Western Civilization: From Myth to Faith
- 2. Great Books of Western Civilization: From Faith to Reason
- 3. Great Books of Western Civilization: The Modern Crisis
- 4. Major Books of the Contemporary World: The Struggle for Freedom
- 5. Fairy Tales, Fables and Parables
- 6. Myths and Legends
- 7. Literature of Fantasy and the Supernatural
- 8. Utopias and their Transformations
- 9. The Short Story and Novella
- 10A-N. Master Authors of World Literature
- 12. Introduction to Women Writers
- 13. Dramatic Literature
- *14. Introduction to Poetry
- *15. The Spiritual Quest
- *20. Man and the Natural World
- *25. Ethnic Minority Writers in World Literature
- *53A. Literature of China and Japan
- *53B. Literature of India and Southeast Asia
- 120. Writing Nature: 1750 to the Present
- 135. Women Writers
- 138. Gender and Interpretation
- 140. Thematic and Structural Study of Literature
- 141. Literary Theory and Criticism
- *142. Critical Reading and Analysis
- *144. The Grotesque
- *145. Representations of the City
- *146. Myth in Literature
- 152. Literature of the Americas

- *153. The Forms of Asian Literature
- 157. War and Peace in Literature
- *158. The Detective Story as Literature
- 159A-G. Special Topics in Comparative Literature
- 160A. The Modern Novel
- *160B. The Modern Drama
- 161A. Tragedy
- *161B. Comedy
- 163. Biography and Autobiography
- *164A. The Middle Ages
- *164B. The Renaissance
- *164C. Baroque and Neoclassicism
- 164D. The Enlightenment
- *166A. The Epic
- *166B. The Novel
- *167. Comparative Study of Major Authors
- 168A. Romanticism
- 168B. Realism and Naturalism
- *169. The Avant-Garde
- *170. The Contemporary Novel
- 180. Selected Topics in Comparative Literature
- *195. Senior Seminar

Dramatic Art

- 20. Introduction to Dramatic Art
- 156. Theatre and Drama: Aeschylus to Machiavelli
- 157. Theatre and Drama: Shakespeare to Schiller
- 158. Theatre and Drama: Ibsen to Albee
- 159. Contemporary Experimental Theatre and Drama

English

- *171A. The Bible as Literature: The Old Testament
- *171B. The Bible as Literature: Prophets and New Testament.

French

- *25. Introduction to French Literature
- *112. Masterpieces of French Drama
- *113. Masterpieces of French Novel
- *114. French Philosophical Literature

German

- 48. Myth and Saga in the Germanic Cultures
- 49. Freshman Colloquium
- 50. Survey of German Culture
- 51. Introduction to Literary Analysis
- 52A. Great Books of German Culture in English Translation: Age of Faith
- 52B. Great Books of German Culture in English Translation: Age of Reason
- 52C. Great Books of German Culture in English Translation: Age of Relativity
- 110. Older German Literature
- 111A-H. Studies of Major Writers
- 112A-C. Topics in German Literature
- 113. Goethe's *Faust*
- 114. The *Faust* Tradition before and after Goethe
- 115A. German Literature since 1945
- 115B. German Literature since 1945
- 116. From Goethe's *Werther* to Today's *Wenthers*
- 117A. The Tristan Tradition: Medieval, Musical, Modern
- 117B. The Nibelungen Tradition: Medieval, Musical, and Modern
- 117C. The Parzival Tradition: Medieval, Musical, and Modern
- 118A. Fin-de-siècle Vienna (The Swan Song of the Habsburg Empire)
- 118B. Weimar Culture: Defeat, the Roaring Twenties, the Rise of Nazism
- 118C. Germany under the Third Reich
- 118E. Contemporary German Culture
- 119. From German Fiction to German Film
- 130. Modernity and its Discontents: the Tradition of German Cultural Critique
- 140. German Political Literature from the Middle Ages to the Present
- 141. The Holocaust and its Literary Representation

- 142C. New German Cinema: From Oberhausen to the Present

Italian

- *139B. Boccaccio, Petrarch and the Renaissance
- *140. Italian Literature in English Translation: Dante, *Divine Comedy*

Japanese

- *10. Masterworks of Japanese Literature (in English)
- *15. Introduction to Traditional Japanese Culture
- 50. Introduction to the Literature of China and Japan
- 101. Japanese Literature in Translation: The Early Period
- 102. Japanese Literature in Translation: The Middle Period
- 103. Japanese Literature in Translation: The Modern Period
- *104. Modern Japanese Literature: War and Revolution
- *105. Modern Japanese Literature: Hero and Anti-Hero
- 106. Japanese Culture through Films
- *107. Modern Japanese Autobiographics (in English)
- *108. Poetry of China and Japan

Native American Studies

- 181A. Native American Literature (the novel and fiction)
- 181B. Native American Literature (non-fiction works by native authors)
- 181C. Native American Literature (traditional literature and poetry)
- 188. Special Topics in Native American Literary Studies

Russian

- 41. Survey of Nineteenth-Century Russian Literature
- 42. Survey of Twentieth-Century Russian Literature
- 44. Children's Literature in Russia
- 121. Nineteenth-Century Russian Prose
- *123. Twentieth-Century Russian Prose
- *126. The Russian Theater
- 130. Contemporary Soviet Culture
- *131. Literature of Revolution
- *132. Nature and Culture in the Soviet Union
- 140. Dostoevsky
- *141. Tolstoy
- *150. Russian Culture
- 151. Soviet Writers and Censorship
- *154. Russian Folklore
- 166. Representations of Sexuality in Russian Literature

Spanish

- 149. Latin-American Literature in Translation

- Masako Darrough, Ph.D., Associate Professor
- Scott Davis, Ph.D., Assistant Professor
- Richard C. Dorf, Ph.D., Professor (*Management, Electrical and Computer Engineering*)
- Paul A. Griffin, Ph.D., Professor
- Michael Hagerty, Ph.D., Associate Professor
- John Lyon, Ph.D., Assistant Professor
- Michael Maher, Ph.D., Professor
- Alexander F. McCalla, Ph.D., Professor (*Agricultural Economics*)
- Donald Palmer, Ph.D., Associate Professor
- David M. Rocke, Ph.D., Professor
- Jerome J. Suran, B.S., Ph.D. (hon.), Senior Lecturer (*Management, Electrical and Computer Engineering*)
- Donald M. Topkis, Ph.D., Professor
- Chih-Ling Tsai, Ph.D., Associate Professor
- Gary M. Walton, Ph.D., Professor (*Management, Economics*)
- David Woodruff, Ph.D., Assistant Professor

Courses in Management (MGT)

Lower Division Courses

11A. Elementary Accounting (4) I, II. Darrough
Lecture—3 hours; discussion—1 hour. Basic concepts of accounting; interpreting and using financial statements; understanding accounting principles. (Former course Economics 11A.)

11B. Elementary Accounting (4) II. Darrough
Lecture—3 hours; discussion—1 hour. Prerequisite: course 11A. Product costing; using accounting information for decision making; planning and performance evaluation. (Former course Economics 11B.)

Upper Division Course

100. Introduction to Financial Accounting (3) Griffin
Lecture—3 hours. Prerequisite: no prior knowledge of accounting is required. Course is open to all upper division undergraduate and graduate students, except those in the Graduate School of Management. Introduction to the concepts, methods, and uses of accounting and financial reporting. Preparation of financial statements, including balance sheet and statements of income and cash flow, as well as their analysis by investors and managers.

Graduate Courses

(Core Courses)

The core courses are being revised subject to approval by the Graduate Council. For further information, contact the Graduate School of Management.

200A. Financial Accounting (3) I. Lyon
Lecture—3 hours. Prerequisite: graduate student. Introduction to the concepts and objectives underlying the preparation of financial statements. Topics include understanding the accounting cycle, measurement and valuation problems associated with financial statement components, consideration of the usefulness of financial statements in the analysis of a corporation's operations. Not open for credit to students who have completed former course 201A.

200B. Managerial Accounting (3) III. Maher
Lecture—3 hours. Prerequisite: graduate student in the Graduate School of Management MBA program or consent of instructor. Information managers should know to be effective, including: product costing, motivating people, and differential analysis for decision making. Includes team projects and written and oral presentations. Not open for credit to students who have completed former course 201B.

201A. The Individual and Group Dynamics (3) I. Palmer
Lecture—3 hours. Prerequisite: graduate student in the Graduate School of Management MBA program or consent of instructor. Examines basic psychological and social psychological processes shaping human behavior and applies knowledge of these processes to the following organizational problems: motivation, job design, commitment, socialization, culture, individual and group decision making, and team building. Not open for credit to students who have completed former course 202.

Management, School of

Robert H. Smiley, Ph.D., Dean
School Office, 106 AOB 4 (916-752-7362)

Faculty

- Peter Algert, Ph.D., Assistant Professor
- Brad Barber, Ph.D., Assistant Professor
- Nicole W. Biggart, Ph.D., Professor (*Management, Sociology*)
- George Bittlingmayer, Ph.D., Associate Professor
- David S. Bunch, Ph.D., Assistant Professor
- Richard P. Castanias, Ph.D., Associate Professor
- Peter Clark, Ph.D., Professor

201B. Organizational Structure and Strategy (3) II. Biggart

Lecture—4 hours; group projects, experiential exercises. Prerequisite: graduate student in the Graduate School of Management MBA program or consent of instructor. Analysis of structural properties of organization including differentiation and vertical and horizontal integration. Alternative structural arrangements including functional, divisionalized, matrix, and hybrid structures. Relationship between environment, structure, and strategic objectives. Organization life cycles and change. Not open for credit to students who have completed former course 203.

202A. Markets and the Firm (3) I. Bittlingmayer

Lecture—3 hours; group projects, experiential exercises. Prerequisite: graduate student in the Graduate School of Management MBA program or consent of instructor. Examines the interaction of consumers, firms and government, and the effect this interaction has on the use of resources and firm profitability. Fundamental economic concepts such as marginal analysis, opportunity cost, pricing, and externalities are introduced and applied. Not open for credit to students who have completed former course 204.

202B. Business, Government, and the International Economy (3) II. Clark

Prerequisite: course 202A or 402A or consent of instructor. Examines the influence of government and international factors on business. Topics include distribution of income, business cycles, inflation and interest rates, the federal debt, monetary policy and international trade and finance. Not open for credit to students who have completed former course 205.

203A. Data Analysis for Managers (3) I. Tsai

Lecture—3 hours. Prerequisite: graduate student in the Graduate School of Management MBA program or consent of instructor. Introduction to statistics and data analysis for managerial decision making. Descriptive statistics, principles of data collection, sampling, quality control, statistical inference. Application of data analytic methods to problems in marketing, finance, accounting, production, operations, and public policy. Not open for credit to students who have completed former course 210A.

203B. Forecasting and Managerial Research Methods (3) II. Locke

Lecture—3 hours. Prerequisite: course 203A or 403A or consent of instructor. Advanced statistical methods for managerial decision making, regression analysis, time series analysis and forecasting, design and analysis of experiments in managerial research. Application of these methods to marketing, finance, accounting, production, operations, and public policy. Not open for credit to students who have completed former course 210B.

204. Marketing Management (3) III. Davis

Lecture—3 hours. Prerequisite: graduate standing and the satisfactory completion of an intermediate-level course in price theory and statistics; or undergraduates with an undergraduate introductory course in marketing; or consent of instructor. Analysis of market opportunities, elements of market research, development of marketing strategies, market planning and implementations, and control systems. Consumer and industrial markets, market segmentation, pricing strategies, distribution channels, promotion, and sales. Not open for credit to students who have completed former course 208.

205. Financial Theory and Policy (3) III. Algert

Lecture—3 hours. Prerequisite: graduate student and course 200A or 400A, 202A or 402A, and 203A or 403A. Corporate financial policy and investment management. Covers capital budgeting, optimal financial structure, cost-of-capital determination, risk measurement. Develops basic valuation principles for investments with long-lived and risky cash-flows, and extends these to derivative securities, asset portfolios, investment management and hedging. Not open for credit to students who have completed former course 207.

206. Decision Making and Management Science (3) II. Bunch

Lecture—3 hours. Prerequisite: graduate student in

the Graduate School of Management MBA program or consent of instructor. Develops decision-making and problem-solving skills in conjunction with a quantitative model-building approach. Emphasizes how structured modeling techniques, probability forecasts, simulations, and computer optimization models are used in the overall process of making decisions in an uncertain environment. Not open for credit to students who have completed former course 211.

207. Management Information Systems (3) II. Topkis, Woodruff

Lecture—3 hours. Prerequisite: graduate student or consent of instructor. Introduction to computer programming and data handling skills. Use of computer in organizations, emphasis on managerial aspects of computing. Standard and nonstandard uses of data files, centralization versus decentralization of computing, office automation, computer security. Not open for credit to students who have completed former course 209.

(Second-Year Courses)

Students must complete the Management core course requirement before enrolling in any of the following courses, or petition with consent of the instructor.

215. Law and Legal Process (3) The Staff

Lecture—3 hours. Introduction to law and legal process in the United States. Sources of law. Structure and operation of courts, federal-state relationships, fundamentals of administrative law, fundamentals of business law.

216. Middle-level Management: Budgets, Controls and Ethics (3) I. The Staff

Lecture—3 hours. Prerequisite: undergraduate degree. Performance measures, budgetary controls and ethical pressures which occur at middle management levels in service-type operations. Addresses such organizations as engineering, medical groups, law offices, management consultants.

220. Public Budgeting and Finance (3) The Staff

Lecture—3 hours. Fiscal role of government in a mixed economy and democratic society; economics and politics of taxation and resource allocation; inter-governmental financial relations; budgeting activities of local governments.

223. Power and Influence in Management (3) Palmer

Seminar—3 hours. Prerequisite: consent of instructor. Investigation of the bases of power in organizations and the tactics used to translate power into influence. Topics include the control of resources (including information), social psychological processes (including commitment), the construction of meaning, and ethics.

***224. Human Resources Management (3) Biggart**

Lecture—3 hours. Problems of recruiting, training, motivating, compensating, and separating workers in contemporary organizations. Topics include design of incentive systems, career management, professionalization, alienation, worker burnout, organizational deviance, and current issues such as affirmative action and the unionization of public employees.

***225. Labor Relations (3) The Staff**

Lecture—3 hours. Course deals with labor organization, employment relationships, employer-employee negotiations, contracts, and litigation. Worker and management rights, and collective bargaining in the public and private sectors will be explored.

227. Managing a Diverse Workforce (3) I. Biggart

Lecture—3 hours. Prerequisite: graduate student. Reviews recent demographic changes such as increased ethnic diversity and an aging population in the regional and national labor force. The impact of these changes on hiring practices, internal labor markets, compensation and benefits issues, and non-traditional work arrangements.

228. Statistical Quality Control and Productivity Improvement (3) Locke

Lecture—3 hours. Prerequisite: courses 210A and 210B or the equivalent. Introduces concepts of quality and productivity improvement as applied to service and production industries and the public sector. Methods covered include statistical quality control

techniques such as control charts and acceptance sampling, reliability, and graphical tools.

229. Global Strategy (3) Biggart

Lecture—3 hours. Examines recent restructurings in the world economy including the European Economic community, East Asian economies of Japan, Taiwan, and South Korea, and changes in Eastern Europe. Discussion of the proposed Free Trade Pact between the U.S., Canada, and Mexico.

***232. Urban Policy and Planning (3) The Staff**

Lecture—3 hours. Analysis of public policy in an urban setting, focusing on the efficiency effects of such policies. Topics include urban spatial structure, growth-management policies, housing, transportation, environmental quality, local government finance, and urban planning.

***233. Regulation and Policy in Agriculture (3) The Staff**

Lecture—3 hours. Implications for management of regulation and public policy on agricultural production choices, practices, processing, and marketing; influences on management strategy, organization, business practices, and resource productivity; trends in regulation and policy and their potential for management strategies are explored.

240. Management Policy and Strategy (3) I. Suran, Hagerty

Lecture—3 hours. Prerequisite: first-year core courses of M.B.A. program. Examines the scope of missions, objectives strategies, policies, structures, measurements and incentives which bear on the management of an organization. Real "client" organizations, in the private and public sectors, are assigned to student teams as the subjects of study.

241. Managerial Decision Making (3) Bunch

Lecture—3 hours. Develops analytical skills for evaluating decisions and solving problems in various managerial settings. Emphasis is on problem structuring, decision analysis, and implementation. Course examines individual decision strategies, group processes, and organizational decision making.

244. New and Small Business Ventures (3) Dorf

Lecture—3 hours. Emphasizes starting a new business venture or managing a small, ongoing business during its formative stages. The business plan. Legal forms, financial considerations, the management team. The entrepreneur. Students develop a detailed business plan.

245. International Marketing (3) II. Hagerty

Lecture—3 hours. Prerequisite: graduate student and course 204. Teaches marketing strategy and tactics applied across national borders. Includes lectures and cases on import/export, joint ventures, off-shore subsidiaries, management contracts, transfer pricing, and currency exchange. Gives methods of market research and competitor intelligence in diverse cultures.

246. Negotiation and Team Building (3) III. Hagerty

Lecture—3 hours. Prerequisite: courses 202, 205. Teaches basic theory of negotiation; applies theory to process of building teams to achieve business purposes. Covers integrative and distributive strategies of claiming value, how to recognize bargaining tricks, uncovering hidden agendas, brain-storming to extend Pareto frontier.

248. Marketing Strategies (3) Hagerty

Lecture—3 hours. Examines process by which organizations develop strategic marketing plans. Includes definition of activities and products, marketing audits, appraising market opportunities, design of new activities and products, and organizing marketing planning function. Applications to problems in private and public sector marketing.

249. Marketing Research (3) Hagerty

Lecture—3 hours. Course addresses the managerial issues and problems of systematically gathering and analyzing information for making private and public marketing decisions. Covers the cost and value of information, research design, information collection, measuring instruments, data analysis, and marketing research applications.

250. Technology Management (3) Suran
Lecture—3 hours. Management of the engineering and technology activity. Functions of design, planning, production, marketing, sales, and maintenance. Technological product life cycle. Research and development activity. Project planning and organization. Manufacturing issues. Case studies.

251. Management of Innovation (3) Dorf
Lecture—3 hours. Managing innovative enterprise in changing and uncertain environments. Covers technology forecasting and assessment, program selection and control, financial management, regulation, and ethics.

252. Production and Operations Management (3) Woodruff
Lecture—3 hours. Explores methods of increasing operational efficiency in production and service organizations through planning and scheduling, materials management, inventory control, quality control, and distribution. Methodologies employed include such techniques as programming, simulation, systems analysis, queueing, and network models.

260. Financial Management (3) Castanias
Lecture—3 hours. Focuses on planning, acquiring, and managing a company's financial resources. Includes discussion of financial aspects of mergers and other forms of reorganization; analysis of investment, financial, and dividend policy; and theories of optimal capital structure.

261. Investment Analysis (3) Barber
Lecture—3 hours. Examines modern asset pricing theory and the implications of that theory for the analysis and management of stocks, bonds, and other financial securities. Factors influencing the value of stocks, bonds, options, warrants, and other securities are discussed from the perspective of a portfolio fund manager.

262. Money and Security Markets (3) Bittlingmayer
Lecture—3 hours. Examines how money and securities markets are organized; how public agencies, businesses, others obtain and invest funds in those markets. Relationship between interest rates, monetary policy, government's role in improving capital markets, approaches to assessing changes in regulation in specific markets.

263. Options and Futures Markets (3) Barber
Lecture—3 hours. Studies the behavior of options and futures markets; how public agencies, businesses, others use those markets. Studies nature of various strategies involving options, commodity, financial futures contracts. Price determination in options and futures markets is also examined.

264. Business Taxation (3) Blumenfeld
Lecture—3 hours. Analysis of the impact of business taxation on investment, production, and finance decisions. Discussion of the relationship between business organization and tax liability. Course is not intended for tax specialists.

265. Theory of Financial Decision Making (3) Castanias
Lecture—3 hours. Prerequisite: course 207 or the equivalent. Theory of financial decision making.

266. International Finance (3) Castanias
Lecture—3 hours. Prerequisite: course 207 or the equivalent. Open economy macroeconomics, balance of payments theory, and financial decision making in multinational firms.

***267. The National and International Economy (3)** Clark
Lecture—3 hours. Prerequisite: familiarity with basic macroeconomic concepts is required. Completion of an introductory course in macroeconomics is sufficient, but additional course can be helpful. Open to Graduate School of Management students; non-GSM graduate students may enroll with consent of instructor. Provides a framework for the analysis of aggregate output, interest rates and the price level within the United States, and the linkage of U.S. economy to the economies of the rest of the world through the exchange rate and international trade.

268. Management Communications (3) Kennedy
Lecture—3 hours. The theories, strategies, and skills necessary for effective communication in management. Students will learn to improve their business writing, and will deliver business presentations orally.

269. Case Studies in Corporate Finance (3) Barber
Lecture—3 hours. Prerequisite: course 201A, 207. Financial issues facing firms with a need to raise capital in financial markets. Unique course format uses case studies to analyze decisions which firms face.

270. Corporate Financial Reporting (3) Griffin
Lecture—3 hours. Analyzes and evaluates contemporary issues in financial reporting and develops implications of those issues for business decision makers, investment managers, and accounting policy makers.

271. Accounting and Budgeting for Management Control (3) Maher
Lecture—3 hours. Examines concepts and techniques of accounting and budgeting for management decision making in the private sector. Topics include cost control, capital budgeting, performance evaluation, and the effects of uncertainty in achieving management objectives.

272. Evaluation of Financial Information (3) Griffin
Lecture—3 hours. Studies how investors, creditors, others use accounting and other information in making rational investment, lending decisions. Emphasis is placed on the analysis of financial information in a variety of contexts. Where applicable, recent research in finance and economics is discussed.

273. Accounting and Reporting for Governmental and Nonprofit Entities (3) Maher
Lecture—3 hours. Concepts, methods, and uses of accounting and financial reporting by governmental and nonprofit entities. Introduction to budgeting and performance evaluation, and accounting for entities such as hospitals, universities, and welfare agencies.

274. Auditing, Internal Control, and Public Accounting (3) Lyon
Lecture—3 hours. Concentrates on role of the independent public accountant as auditor and consultant, from the perspective of an enterprise manager. Auditing standards, auditing procedures, and auditing control techniques are discussed. Emphasis is also given to current issues confronting the accounting profession.

275A-275B. Seminar in Finance and Accounting (3-3) Il-III. Castanias, Barber, Lyon
Seminar—3 hours. Prerequisite: Economics 200A-200B-200C. Foundations and recent developments in the theory of finance and accounting, and relevant empirical evidence. Seminar emphasizing the reading and discussion of academic articles.

276. Real Estate, Finance and Development (3) Il. The Staff
Lecture—3 hours. Prerequisite: course 201A and 207. Focus on single family, attached, detached, multifamily, and light commercial development. Students will study factors which make up successful real estate developments. Course will consider financial aspects involved in land acquisition, land development, construction, and project lending.

***280. Data and File Management (3)** Topkis
Lecture—3 hours. Concepts of information storage and retrieval on digital computers. Emphasis on file structures and their uses within organizations; applications drawn from both the public and private sector.

281. Systems Analysis and Design (3) Woodruff
Lecture—3 hours. Design and specification of computer-based information systems. Applications systems development life cycle, use requirements and feasibility assessment, logical and physical design, program development and testing, conversion and implementation.

***283. Optimization Theory and Applications (3)** Topkis
Lecture—3 hours. Introduces applied optimization theory. Examines linear, nonlinear, discrete, and dynamic programming; optimality conditions; transportation, networks, and large-scale systems; and computer implementation. Applications are made to problems in private and public management.

284. Applied Linear Models for Management (3) Tsai
Lecture—3 hours. Covers regression, analysis of variance, and multivariate analysis. Topics will focus on applications to management and policy problems.

285. Time Series Analysis and Forecasting (3) Tsai
Lecture—3 hours. Considers application of time series methods to evaluation and forecasting problems. Covers univariate and multivariate ARIMA models and transfer function models. Applications will be in such areas as economics, finance, budgeting, program evaluation, and industrial process control.

286. Telecommunications and Computer Networks (3) Topkis
Lecture—3 hours. Prerequisite: course 280. Communication system components; common carrier services; design and control of communications networks; network management and distributed environment; local area networks; data security in computer networks.

287. Database Systems (3) Topkis
Lecture—3 hours. Prerequisite: course 280. Hierarchical, network, and relational models for database systems. Design and implementation of models. Performance evaluation and benchmarking. Query structures and languages. Data security and integrity. Application to managerial decision making and decision support systems.

***288. Special Topics in Management of Information Systems (3)** Topkis
Lecture—3 hours. Managerial aspects of information systems. Topics stressing applications in organizations chosen from: economics of computers and information systems, decision support systems, management of computer-based information systems, office automation.

290. Seminar in Management (3)
Seminar—3 hours. Interdisciplinary case study of a real business or government enterprise.

298. Directed Group Study (1-5) The Staff
Prerequisite: consent of instructor.

299. Individual Study (1-12) The Staff
Prerequisite: consent of instructor. (S/U grading only.)

Master of Education (M.Ed.) (A Graduate Group)

James Grieshop, Ph.D., Chairperson of the Group
Group Office, 1303 Hart Hall (916-752-1926).

Faculty. This interdisciplinary graduate group consists of faculty from departments such as Agricultural Engineering, Applied Behavioral Sciences, Community Health, Consumer Science, Division of Education, Environmental Design, Environmental Horticulture, Human Development, Native American Studies, Nutrition, Plant Science, Psychology, Rhetoric and Communication, Textiles and Clothing, and Vegetable Crops.

Graduate Study. The Master of Education Graduate Group is housed in the Department of Applied Behavioral Sciences. Master of Education (M.Ed.) degree students are preparing for leadership and professional roles in community and development education related to planning, organizational change, and evaluation. Areas of study include: health education planning; community services planning and program management; community and non-formal education; international development education; program design and evaluation; organizational decision making; leadership development, communication and change; extension education; environmental education; agricultural development education; and consumer behavior.

Requirements. The M.Ed. degree requires 36 units minimum of upper division and graduate courses. A minimum of 18 of these units must be graduate level courses; and at least 8 units must be related to research methods and/or statistics. Students submit a required Program of Study Plan in the area of intended specialization by the end of the first quarter of graduate study. A research-based field project and comprehensive oral examination are required for completion of this degree.

Graduate Adviser. Contact Group office.

Mathematics

(College of Letters and Science)

Henry L. Alder, Ph.D., Chairperson of the Department

Joel Hass, Ph.D., Vice-Chairperson of the Department (Graduate Matters)

Angela Y. Cheer, Ph.D., Vice-Chairperson of the Department (Undergraduate Matters)

Department Office, 565 Kerr Hall (916-752-0827)

Faculty

Henry L. Alder, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*

David W. Barnette, Ph.D., Professor

David J. Barsky, Ph.D., Assistant Professor

Carlos R. Borges, Ph.D., Professor

Robert J. Buck, Ph.D., Associate Professor

Gulbank D. Chakerian, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*

Angela Y. Cheer, Ph.D., Associate Professor

Doyle O. Cutler, Ph.D., Professor

James R. Diederich, Ph.D., Professor

Allan L. Edelson, Ph.D., Professor

Alice Fialowski, Ph.D., Associate Professor

Dimitri B. Fuchs, Ph.D., Professor

Janko Gravner, Ph.D., Assistant Professor

Joel Hass, Ph.D., Associate Professor

John K. Hunter, Ph.D., Professor

Kurt Kreith, Ph.D., Professor

Arthur J. Krener, Ph.D., Professor

Yingchen Li, Ph.D., Assistant Professor

E. O. Milton, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*

Motohico Mulase, Ph.D., Professor

Washek F. Pfeffer, Ph.D., Professor

E. Gerry Puckett, Ph.D., Associate Professor

Jeremy D. Quastel, Ph.D., Assistant Professor

G. Thomas Sallee, Ph.D., Professor

Albert Schwarz, Ph.D., Professor

Evelyn M. Silvia, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*

David M. Stuart, Ph.D., Assistant Professor

J. Blake Temple, Ph.D., Professor

Abigail Thompson, Ph.D., Associate Professor

Craig A. Tracy, Ph.D., Professor

Howard J. Weiner, Ph.D., Professor

Roger J-B. Wets, Ph.D., Professor

Emeriti Faculty

Hubert A. Arnold, Ph.D., Professor Emeritus

George A. Baker, Ph.D., Professor Emeritus

Dallas O. Banks, Ph.D., Professor Emeritus

Donald C. Benson, Ph.D., Professor Emeritus

Albert C. Burdette, Ph.D., Professor Emeritus

Curtis M. Fulton, Ph.D., Professor Emeritus

Robert D. Glauz, Ph.D., Professor Emeritus

Charles A. Hayes, Jr., Ph.D., Professor Emeritus

Melven R. Krom, Ph.D., Professor Emeritus

Gary J. Kurowski, Ph.D., Professor Emeritus

David G. Mead, Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award*

Donald A. Norton, Ph.D., Professor Emeritus

Sherman K. Stein, Litt.D. (hon.), Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award*

Robert W. Stringall, Ph.D., Professor Emeritus

Takayuki Tamura, D.Sc., Professor Emeritus
Edward J. Tully, Jr., Ph.D., Professor Emeritus

The Major Programs

Mathematics is the study of abstract structures, space, change, and the interrelations of these concepts. It also is the language of the exact sciences.

The Program. Students majoring in mathematics may follow a program leading to either the Bachelor of Arts or the Bachelor of Science degree. After completing basic introductory courses such as calculus, students plan an upper division program in consultation with a faculty adviser. This individualized program can lead to graduate study in pure or applied mathematics, to elementary or secondary level teaching, or to other professional goals. It can also reflect a special interest such as computer science, statistics, or applied mathematics, or may be combined with a major in some other field.

Career Alternatives. A degree in mathematics provides entry to many careers in addition to teaching. For instance, operations research, systems analysis, computing, actuarial work, insurance, and financial services are only a few such careers. Mathematics is also a sound basis for graduate work in a variety of fields, such as law, engineering, and economics.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	37-41
Mathematics 12 (or high school equivalent) ..	0-3
Mathematics 21A, 21B, 21C, 21D, 22A, 22B	22
Computer Science Engineering 30 or Engineering 5	3-4
Physics 9A	4
Additional non-Mathematics courses chosen from natural sciences	8
Core Requirements	36
Mathematics 108	4
Mathematics 127A, 127B	8
Mathematics 149A, 149B; or 150A, 150B	8
Choose one Track from the following two ..	16
Track 1: Secondary Teaching	
Mathematics 115A	3
Mathematics 141	3
Additional upper division units	10
Recommended: Mathematics 115B, 115C, 116, 167, 168; Mathematics 131 and Statistics 131B or Statistics 131A-131B or Statistics 130A-130B; Computer Science Engineering 110, 122.	
Track 2: General Mathematics	
Additional upper division units	16
Total Units for the Major	73-77

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	30-41
Mathematics 12 (or high school equivalent) ..	0-3
Mathematics 21A, 21B, 21C, 21D, 22A, 22B	22
Computer Science Engineering 30 or Engineering 5	3-4
Physics 9A, 9B, 9C (Tracks 1 and 2 only) ..	12
Physics 9A (Track 3 only)	4
Statistics 13, 32, or 102 (Track 4 only)	3-4
Core Requirements	45
Mathematics 108	4
Mathematics 127A, 127B	8
Choose one Track from the following four ..	33
Track 1: Preparation for Graduate Study in Mathematics	
Mathematics 127C	4
Mathematics 150A, 150B, 150C	12
One course from Mathematics 125, 126, 147	3
Additional upper division units	14
Recommended: Mathematics 118A, 118B, 119, 125, 126, 141, 147, 185A, 185B.	

Track 2: Applied Mathematics

Mathematics 150A, 150B	8
Mathematics 167	3
Two courses from Mathematics 128A, 128B, 128C	8
Additional upper division units	14
Recommended: Mathematics 118A, 118B, 118C, 119, 145, 168, 185A, 185B, Statistics 131 or Mathematics 131A, Computer Science Engineering 110, 122, up to 8 units of courses outside of mathematics department related to area of interest.	

Track 3: Mathematics for Secondary Teaching

Mathematics 115A	3
Mathematics 141	3
Mathematics 149A, 149B; or 150A, 150B	8
Additional upper division units	19
Recommended: Mathematics 115B, 115C, 167, 168, Statistics 130A, 130B, or 131 and Statistics 131B or Statistics 131A, 131B, Computer Science Engineering 110, 122.	

Track 4: General Mathematics

Mathematics 149A, 149B; or 150A, 150B	8
Additional upper division units	25

Total Units for the Major

Recommended Language Preparation.

Bachelor of Science degree candidates are advised, but not required, to satisfy the same language requirement as that for a Bachelor of Arts degree candidate, and to fulfill it in French, German, or Russian.

Depth Subject Matter Requirements.

Certain mathematically oriented courses given by other departments may be admissible in partial satisfaction of the above mentioned 36- or 45-unit requirements with prior departmental approval. In general, 192, 194, 197TC, 198, and 199 courses are not appropriate for application towards this requirement; and any exceptions must be approved by the Department's Undergraduate Program Committee.

Qualifying Examination. Among the prerequisites for taking Mathematics 12, 16A, 21A, 21AH, 36, and 63 is a passing score on the Qualifying Examination, and, in the cases of all the above courses except Mathematics 12, a passing score on the examination's trigonometric component. This examination is to be taken on this campus. Students are responsible for finding out their scores, which are available within 72 hours of the examination, at the Learning Skills Center, and for retaining the printout of their scores. Students who do not pass the examination will be administratively dropped from the courses mentioned above. Dates and times when the examination is offered are posted at the Mathematics Department.

Statement of Objectives. As early as possible, but no later than the last quarter of the sophomore year, each prospective mathematics major should choose, in consultation with an adviser, one of the tracks as suggested by the adviser, prepare a statement of his or her mathematics objectives, and have a proposed program satisfying the requirements of the chosen track. The form to be used for this statement is available from the Department, and must be submitted in time to receive final approval prior to the last day of instruction of the first quarter of the junior year. Prospective mathematics majors transferring to the University at the upper division level should consult an adviser immediately upon arrival.

Major Advisers. H.L. Alder, C.R. Borges, J.R. Diederich, A. Edelson, C. Horn, M.R. Krom, E.O. Milton, E.M. Silvia, J.B. Temple, R.J.-B. Wets.

Information for Undergraduates. Assistance in planning an undergraduate major program in mathematics should be obtained from a major adviser. In addition, students seeking information pertaining to the application of mathematics to the biological or social sciences or computer science may contact the appropriate special area adviser.

Students desiring preparation towards an A.B. degree for secondary teaching or general mathematics, or a B.S. degree for graduate study, biological sciences,

physical sciences, secondary teaching, or general mathematics should consult an undergraduate adviser.

Prerequisite Credit. No student may repeat a course, if that course is a prerequisite for a course which has already been completed with a grade of C- or better.

Minor Program Requirements:

UNITS

Mathematics.....20
Upper division units in mathematics (exclusive of Mathematics 192, 197TC, 198, 199)20
Three of these units could be from Mathematics 36.

Teaching Credential Subject Representative. G.T. Sallee. See also under Teacher Education Program.

Graduate Study. The Department offers programs of study and research leading to the M.A., M.A.T., and Ph.D. degrees in mathematics. Detailed information regarding graduate study may be obtained by writing to the Graduate Coordinator, Department of Mathematics.

Courses in Mathematics (MAT)

Lower Division Courses

B. Elementary Algebra (no credit) I. The Staff
Lecture—3 hours. Basic concepts of algebra, including polynomials, factoring, equations, graphs, and inequalities. Offered only if sufficient number of students enroll. Not open to Concurrent student enrollment. (P/NP grading only.) (There is a fee of \$45.)

C. Trigonometry (no credit) I, II. The Staff
Lecture—2 hours. Basic concepts of trigonometry, including trigonometric functions, identities, inverse functions, and applications. Offered only if sufficient number of students enroll. Not open to Concurrent student enrollment. (P/NP grading only.) (There is a fee of \$30.)

D. Intermediate Algebra (no credit) I, II. The Staff
Lecture—3 hours. Basic concepts of algebra, designed to prepare the student for college work in mathematics, such as course 16A or 21A. Functions, equations, graphs, logarithms, and systems of equations. Offered only if sufficient number of students enroll. Not open to Concurrent student enrollment. (P/NP grading only.) (There is a fee of \$15.)

12. Precalculus (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: Two years high school algebra, plane geometry, plane trigonometry; and obtaining required score on the Precalculus Qualifying Examination. Topics selected for their use in calculus, including functions and their graphs, slope, zeroes of polynomials, exponential, logarithmic and trigonometric functions, sketching surfaces and solids. Not open to students who have completed any of courses 16A, 16B, 16C, 21A, 21B, or 21C with a C- or better.

(Note: Mathematics 16A, 16B, and 16C are intended for students who will take no more Mathematics courses.)

16A. Short Calculus (3) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: one and one-half years of high school algebra, plane geometry, plane trigonometry, and obtaining required score on Precalculus Qualifying Examination and its trigonometric component. Limits; differentiation of algebraic functions; analytic geometry; applications, in particular to maxima and minima problems. Not open to students who have received credit for course 21A.

16B. Short Calculus (3) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 16A or 21A. Integration; calculus for trigonometric, exponential, and logarithmic functions; applications. Not open to students who have received credit for course 21B.

16C. Short Calculus (3) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 16B or 21B. Differential equations; partial derivatives; double inte-

grals; applications; series. Not open to students who have received credit for course 21C.

21A. Calculus (4) I, II, III. The Staff
Lecture/discussion—4 hours. Prerequisite: two years of high school algebra, plane geometry, plane trigonometry, and analytic geometry or course 12, and obtaining required score on Precalculus Qualifying Examination and its trigonometric component. Functions, limits, continuity. Slope and derivative. Differentiation of algebraic and transcendental functions. Applications to motion, natural growth, graphing, extrema of a function. Differentials. L'Hopital's rule. Only two units of credit will be allowed to students who have credit for course 16A. (Not open to students who have completed course 16B.)

21AH. Honors Calculus (4) I. The Staff
Lecture/discussion—4 hours. Prerequisite: a Precalculus Qualifying Examination score significantly higher than the minimum for course 21A is required. More intensive treatment of material covered in course 21A.

21AL. Emerging Scholars Program Calculus Workshop (2) I. The Staff
Workshop—6 hours. Prerequisite: concurrent enrollment in course 21A. Functions, limits, continuity. Slope and derivative. Differentiation of algebraic and transcendental functions. Applications to motion, natural growth, graphing, extrema of a function. Differentials. L'Hopital's rule. Enrollment for students in the Emerging Scholars Program by instructor's invitation only. (P/NP grading only.)

21B. Calculus (4) I, II, III. The Staff
Lecture/discussion—4 hours. Prerequisite: course 21A or 21AH. Continuation of course 21A. Definition of definite integral, fundamental theorem of calculus, techniques of integration. Application to area, volume, arc length, average of a function, improper integrals, surface of revolution. Only two units of credit will be allowed students who have received credit for course 16B or 16C.

21BH. Honors Calculus (4) II. The Staff
Lecture/discussion—4 hours. Prerequisite: a grade of B or better in course 21A or 21AH. More intensive treatment of material covered in course 21B. Students completing 21BH can continue with course 21CH or the regular 21C.

21BL. Emerging Scholars Program Calculus Workshop (2) II. The Staff
Workshop—6 hours. Prerequisite: course 21A or 21AH, concurrent enrollment in course 21B. Continuation of course 21A. Definition of definite integral, fundamental theorem of calculus, techniques of integration. Application to area, volume, arc length, average of a function, improper integrals, surface of revolution. Enrollment for students in the Emerging Scholars Program by instructor's invitation only. (P/NP grading only.)

21C. Calculus (4) I, II, III. The Staff
Lecture/discussion—4 hours. Prerequisite: course 21B or 21BH. Continuation of course 21B. Sequences, series, tests for convergence, Taylor expansions. Partial derivatives, total differentials. Applications to maximum and minimum problems in two or more variables. Definite integrals over plane and solid regions in various coordinate systems. Applications to physical systems.

21CH. Honors Calculus (4) III. The Staff
Lecture/discussion—4 hours. Prerequisite: a grade of B or better in course 21B or 21BH. More intensive treatment of material covered in course 21C.

21CL. Emerging Scholars Program Calculus Workshop (2) III. The Staff
Workshop—6 hours. Prerequisite: course 21B or 21BH, concurrent enrollment in course 21C. Continuation of course 21B. Sequences, series, tests for convergence, Taylor expansions. Partial derivatives, total differentials. Applications to maximum and minimum problems in two or more variables. Definite integrals over plane and solid regions in various coordinate systems. Applications to physical systems. Enrollment for students in the Emerging Scholars Program by instructor's invitation only. (P/NP grading only.)

21D. Vector Analysis (4) I, II, III. The Staff
Lecture/discussion—4 hours. Prerequisite: course 21C. Vector algebra, vector calculus, scalar and vector fields. Line and surface integrals. Green's theorem, Stokes' theorem, divergence theorem. (Former course 22C.)

22A. Linear Algebra (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: nine units of college mathematics. Matrices and linear transformations, determinants, complex numbers, quadratic forms.

22B. Differential Equations (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: courses 21C, 22A. Solutions of elementary differential equations.

36. Fundamentals of Mathematics (3) I. The Staff
Lecture—3 hours. Prerequisite: obtaining required score on Precalculus Qualifying Examination. Introduction to fundamental mathematical ideas selected from the principal areas of modern mathematics. Properties of the primes, the fundamental theorem of arithmetic, properties of the rationals and irrationals, binary and other number systems. Not open to students who have received credit for course 108. Recommended for non-math majors.

63. Ideas from Mathematics (3) II. The Staff
Lecture—3 hours. Prerequisite: obtaining required score on Precalculus Qualifying Examination. In-depth treatment of some mathematical ideas, selected from all branches of mathematics, and their applications. Concepts, techniques of rigorous proofs and problem solving are emphasized. Intended for students who want to think about some deeper aspects of mathematics. Not open to students who have taken course 108.

71A-71B. Explorations in Elementary Mathematics (3-3) I-II. The Staff (Chairperson in charge)
Lecture—2 hours; laboratory—3 hours. Prerequisite: two years of high school mathematics. Weekly explorations of mathematical ideas related to the elementary school curriculum will be carried out by cooperative learning groups. Lectures will provide background and synthesize the results of group exploration. (Deferred grading only, pending completion of sequence.)

90. Elementary Problem Solving Seminar (1) I, II, III. Weiner
Seminar—1 hour. Prerequisite: high school mathematics. Students solve and present solutions to challenging and interesting problems in elementary mathematics at the board. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

108. Introduction to Abstract Mathematics (4) I, II, III. The Staff
Lecture/discussion—4 hour. Prerequisite: course 21B or consent of instructor. Rigorous treatment of abstract mathematics with the emphasis on developing ability to understand and present mathematics arguments.

***11A. The Theory of Convex Sets** (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 21C, 22A, 108; or consent of instructor. Topics selected from the theory of convex bodies, convex functions, geometric inequalities, combinatorial geometry, and integral geometry. Offered in alternate years.

115A. The Theory of Numbers (3) I. Alder
Lecture—3 hours. Prerequisite: course 108. Divisibility and related topics, diophantine equations, selected topics from the theory of prime numbers.

115B. The Theory of Numbers (3) II. Alder
Lecture—3 hours. Prerequisite: course 108. Euler function, Möbius function, congruences, primitive roots, quadratic reciprocity law. Offered in alternate years.

- 115C. The Theory of Numbers** (3) III. Alder
Lecture—3 hours. Prerequisite: course 108. Continued fractions, partitions. Offered in alternate years.
- 116. Metric Differential Geometry** (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 21D; or consent of instructor. Vector analysis, curves and surfaces in three dimensions. Offered in alternate years.
- 118A. Partial Differential Equations: Elementary Methods** (3) I. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22B, 21D. Derivation of partial differential equations; separation of variables; equilibrium solutions and Laplace's equation; Fourier series; method of characteristics for the one-dimensional wave equation; solution of non-homogeneous equations.
- 118B. Partial Differential Equations: Eigenfunction Expansions** (3) II. The Staff
Lecture—3 hours. Prerequisite: course 118A. Sturm-Liouville Theory; self-adjoint operators; mixed boundary conditions; partial differential equations in two and three dimensions; Eigenvalue problems in circular domains; nonhomogeneous problems and the method of eigenfunction expansions; Poisson's Equations.
- 118C. Partial Differential Equations: Green's Functions and Transforms** (3) III. The Staff
Lecture—3 hours. Prerequisite: course 118B. Green's functions for one-dimensional problems and Poisson's equation; Fourier Transforms; Green's Functions for time dependent problems; Laplace transform and solution of partial differential equations.
- 119A-119B. Ordinary Differential Equations and Dynamical Systems** (3-3) II-III. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22B. Scalar and Planar Autonomous Systems—nonlinear systems and linearization. Phase plane analysis. Classification of singular points. Scalar and Planar maps. Bifurcations and the implicit function theorem. Notions of stability and Liapunov's method. Periodic orbits and their bifurcations. Poincare Bendixon theory.
- 121A. Advanced Calculus for the Sciences** (3) I. The Staff
Lecture—3 hours. Prerequisite: courses 21D, 22A, 22B. Functions of a single real variable; power series, convergence, continuity, differentiation, integration, interchange of limiting procedures, Fourier series, integral transforms. Intended primarily for students majoring in science and engineering.
- 121B. Advanced Calculus for the Sciences** (3) II. The Staff
Lecture—3 hours. Prerequisite: course 121A. Functions of several real variables; continuity, differentiation, implicit functions, integration, calculus of variations, vector analysis. Elementary single complex variable theory. Intended primarily for students majoring in science and engineering.
- *125. Introduction to Mathematical Logic** (3) I. Krom
Lecture—3 hours. Prerequisite: course 108. Propositional calculus, predicate calculus, normal forms, completeness. Offered in alternate years.
- 126. Introduction to the Theory of Sets** (3) III. The Staff
Lecture—3 hours. Prerequisite: course 127A or 150A. Fundamental concepts including cardinal numbers, order types, ordinal numbers. Offered in alternate years.
- 127A-127B-127C. Advanced Calculus** (4-4-4) I, II-III, III-III, I. The Staff
Lecture/discussion—4 hours Prerequisite: courses 21D, 22A, 108. Real number system, continuity, differentiation and integration on the real line; vector calculus and functions of several variables; theory of convergence.
- 128A. Numerical Analysis** (4) I. The Staff
Lecture—3 hours; term project. Prerequisite: course 21C; knowledge of a programming language such as Pascal, FORTRAN or BASIC. Error analysis, approximation, interpolation, numerical differentiation and integration.
- 128B. Numerical Analysis in Solution of Equations** (4) II. The Staff
Lecture—3 hours; term project. Prerequisite: course 21C and 22A; knowledge of a programming language such as Pascal, FORTRAN or BASIC. Solution of nonlinear equations and nonlinear systems. Minimization of functions of several variables. Simultaneous linear equations. Eigenvalue problems.
- 128C. Numerical Analysis in Differential Equations** (4) III. The Staff
Lecture—3 hours; term project. Prerequisite: courses 22A, 22B, and a knowledge of a programming language such as Pascal, FORTRAN or BASIC. Difference equations, operators, numerical solution of ordinary and partial differential equations.
- 131. Methods of Mathematical Probability** (4) II. The Staff
Lecture—4 hours. Prerequisite: courses 21C and 22A. Probability space, event, combinatorics; discrete, continuous distributions; random variables; joint, marginal conditional densities; transformation; expectation; sums and moments; inequalities; laws of large numbers; central limit law; probability models via conditioning; tables. Students who have taken Statistics 131A may not receive credit for this course.
- 132A-132B. Introduction to Stochastic Processes** (3-3) III-I. The Staff
Lecture—3 hours. Prerequisite: course 131 or Statistics 131A. Markov chains, Poisson process, birth and death processes, renewal theory, queueing theory, Brownian motion, stationary processes. Course 132B is offered in alternate years.
- 141. Euclidean Geometry** (3) II. The Staff
Lecture—3 hours. Prerequisite: course 108. An axiomatic and analytic examination of Euclidean geometry from an advanced point of view. In particular, a discussion of its relation to other geometries.
- 145. Combinatorial Mathematics** (3) III. The Staff
Lecture—3 hours. Prerequisite: course 108. Combinatorial methods using basic graph theory counting methods, generating functions, and recurrence relations.
- *147. Topology** (3) III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 108, 127A. Basic notions of point-set and combinatorial topology. Offered in alternate years.
- 149A-149B. Topics in Discrete Mathematics** (4) II, III. The Staff (Chairperson in charge)
Lecture/discussion—4 hours. Prerequisite: course 22A and 108. Coding theory and counting theory and the algebraic concepts needed in their development.
- 150A-150B-150C. Introduction to Abstract Algebra** (4-4-4) I, II, III. The Staff
Lecture/discussion—4 hours. Prerequisite: course 108. Basic concepts of groups, rings, and fields. Emphasizes the techniques used in the proofs of the ideas (Lemmas, Theorems, etc.) developing these concepts. Develops precise thinking, precise writing, and the ability to deal with abstraction.
- *160. Mathematical Foundations of Database Theory, Design, and Performance** (3) I. Diederich
Lecture—3 hours. Prerequisite: course 108 and familiarity with one high-level computer language. The relational model; relational algebra; relational calculus; normal forms; functional and multivalued dependencies. Separability. Cost benefit analysis of physical database design and reorganization. Performance via analytical modeling, simulation, and queueing theory. Block accesses: buffering; operating system contention; CPU intensive operations.
- *164. Mathematical Foundations of Fifth Generation Computing** (3) II. Milton
Lecture—3 hours. Prerequisite: course 108 and a modern high-level computer language. Study of the uses of predicate and various logics in knowledge-based systems. Resolution and non-resolution deduction, forward and backward deduction systems, logic programming, symbolic integration, problem solving strategies, functions in search strategies, mathematical treatment of uncertainty in expert systems.
- 167. Linear Algebra and Applications** (3) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 22A. Introduction to linear algebra: linear equations, orthogonal projections, similarity transformations, quadratic forms, eigenvalues and eigenvectors. Applications to physics, engineering, economics, biology and statistics.
- 168. Mathematical Programming** (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 21C, and 22A or 167; knowledge of a programming language. Linear programming, simplex method. Basic properties of unconstrained nonlinear problems, descent methods, conjugate direction method. Constrained minimization.
- 180. Special Topics: Pure and Applied Mathematics** (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: course 22A and 22B, or consent of instructor. Special topics from various fields of pure and applied mathematics, such as: analysis, algebra, applied mathematics, geometry, topology, computer science, logic, history. May be repeated for credit in different subject area.
- 185A. Functions of a Complex Variable with Applications** (3) II. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 21D. Complex number systems, analyticity and the Cauchy-Riemann equations, elementary functions, complex integration, power and Laurent series expansions, residue theory.
- *185B. Functions of a Complex Variable with Applications** (3) III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 185A or consent of instructor. Analytic functions, elementary functions and their mapping properties, applications of Cauchy's integral theorem, conformal mapping and applications to heat flow and fluid mechanics. Offered in alternate years.
- 190. Advanced Problem Solving Seminar** (1) I, II, III. Weiner
Seminar—1 hour. Prerequisite: two years of college mathematics. Students solve and present solutions to challenging and unusual problems at the board. The problems require a background in at most second-year university mathematics. (P/NP grading only.)
- 192. Internship in Applied Mathematics** (1-3) I, II, III. The Staff (Chairperson in charge)
Internship; final report. Prerequisite: upper division standing; project approval by faculty sponsor prior to enrollment. Supervised work experience in applied mathematics. May be repeated for credit for a total of 10 units. (P/NP grading only.)
- 194. Undergraduate Thesis** (3) I, II, III. The Staff
Prerequisite: consent of instructor. Independent research under supervision of a faculty member. Student will submit written report in thesis form. May be repeated with consent of Vice Chairperson. (P/NP grading only.)
- 197TC. Tutoring Mathematics in the Community** (1-5) I, II, III. The Staff (Chairperson in charge)
Seminar—1-2 hours; laboratory—2-6 hours. Prerequisite: upper division standing and consent of instructor. Special projects in mathematical education which involve the development of techniques for mathematics instruction and tutoring on an individual or small group basis. (P/NP grading only.)
- 198. Directed Group Study** (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)
- 199. Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201A-201B-201C. Analysis (4-4-4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 127 or 203C. Metric and topological spaces. Banach and Hilbert spaces. Completion. Compactness. Abstract measure space. Lebesgue measures and integrals. L^p spaces. Distributions and the Fourier transform. Operators.

202. Functional Analysis (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: course 201A-201B-201C. The theory of Fredholm operators. Examples of Fredholm operators (singular integral operators, elliptic operators in Sobolov spaces). Index theory for Fredholm operators. Unbounded self-adjoint operators. Schrodinger operators and other differential operators. The spectral theorem for these and for unitary operators. Offered in alternate years.

203A-203B-203C. Modern Applied Analysis (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Classical mathematical foundations leading to modern analysis. Linear and metric spaces; Hilbert space; operator theory. Applications to integral and differential equations. Variational methods.

204. Applied Asymptotic Analysis (3) I. The Staff
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Asymptotic analysis and perturbation theory, with applications to optimization, differential equations, and scaling.

205. Complex Analysis (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing or consent of instructor. Theory of holomorphic functions. Riemann mapping theorem and analytic continuation.

210A. Topics in Geometry (3) I. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: bachelor's degree in mathematics or consent of instructor. Topics in advanced geometry related to curriculum at all levels. Required for M.A.T. degree program for prospective teachers. May be repeated for credit with prior consent of instructor.

210AL. Topics in Geometry: Discussion (1) I. The Staff (Chairperson in charge)
Lecture/discussion—1 hour (to be arranged). Prerequisite: course 210A (concurrently); consent of instructor. Special topics related to course 210A which are of special interest to teachers and candidates for M.A.T. degree program. May be repeated for credit.

210B. Topics in Algebra (3) II. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: bachelor's degree in mathematics or consent of instructor. Topics in advanced algebra related to curriculum at all levels. Required for M.A.T. degree program for prospective teachers. May be repeated for credit with prior consent of instructor.

210BL. Topics in Algebra: Discussion (1) II. The Staff (Chairperson in charge)
Lecture/discussion—1 hour (to be arranged). Prerequisite: course 210B (concurrently); consent of instructor. Special topics related to course 210B which are of special interest to teachers and candidates for M.A.T. degree program. May be repeated for credit.

210C. Topics in Analysis (3) III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: bachelor's degree in mathematics or consent of instructor. Topics in advanced analysis related to curriculum at all levels. Required for M.A.T. degree program for prospective teachers. May be repeated for credit with prior consent of instructor.

210CL. Topics in Analysis: Discussion (1) III. The Staff (Chairperson in charge)
Lecture/discussion—1 hour (to be arranged). Prerequisite: course 210C (concurrently); consent of instructor. Special topics related to course 210C which are of special interest to teachers and candidates for M.A.T. degree program. May be repeated for credit.

***213A-213B. Stochastic Dynamics and Applications** (3-3) II-III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 210C or 235C or consent of instructor. Stochastic processes including Gaussian, Markov and stationary processes. Diffusion, martingales, stochastic differential equations. Applications and advanced topics. Offered in alternate years.

215A-215B-215C. Topology (4-4-4) I-II-III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour or paper (instructor's option). Prerequisite: graduate standing in mathematics or consent of instructor. Topics selected from point-set topology, homotopy theory, and homology theory. Offered in alternate years.

218A-218B. Partial Differential Equations (3-3) II-III. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 127C. Topics from the theory of partial differential equations and integral equations. Offered in alternate years.

***219A-219B. Ordinary Differential Equations** (3-3) II-III. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 127C. Ordinary differential equations in the real and complex domains; existence and uniqueness theorems; linear systems; analysis of singular points; Sturm-Liouville theory; asymptotic expansions. Offered in alternate years.

***221A-221B. Mathematical Fluid Dynamics** (3-3) I-II. The Staff
Lecture—3 hours. Prerequisite: course 118B. Dynamics of fluid motion, perfect fluids, rotational and irrotational motion, two-dimensional and three-dimensional axisymmetric flows, compressible and incompressible viscous fluids. Offered in alternate years.

228A-228B-228C. Numerical Solution of Differential Equations (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 128C. Numerical solutions of initial-value, eigenvalue and boundary-value problems for ordinary differential equations. Numerical solution of parabolic and hyperbolic partial differential equations. Offered in alternate years.

***229A-229B. Numerical Methods in Linear Algebra** (3-3) I-II. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Computational methods for the solution of linear algebraic equations and matrix eigenvalue problems. Analysis of direct and iterative methods. Special methods for sparse matrices. Offered in alternate years.

235A-235B-235C. Probability Theory (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 127C and Statistics 131A-131B or the equivalent. Measure theoretic foundations, abstract integrations, modes of convergence, limit theorems, independence, laws of large numbers, characteristic functions, central limit theorem, conditional expectations; topics from discrete time Markov and stationary processes, ergodic theory, Brownian motion, weak convergence, Wiener and Poisson processes. (Same course as Statistics 235A-235B-235C.)

***240A-240B-240C. Differential Geometry** (3-3-3) I-II-III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 116 or consent of instructor. Introduction to differentiable manifolds, the tangent bundle, tensor fields, differential forms. DeRham cohomology, connections, Lie groups, Riemannian geometry. Offered in alternate years.

250A-250B-250C. Algebra (4-4-4) I-II-III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour or paper (instructor's option). Prerequisite: graduate standing in Mathematics or consent of instructor. Theory of groups, rings, and fields.

***257. Topics in Optimization** (3) III. The Staff
Lecture—3 hours. Prerequisite: graduate standing. Advanced topics in the theoretical foundations of optimization and its applications, such as: linear and nonlinear systems theory, stochastic programming, stochastic optimal control, approximation theory for optimization, advanced topics in numerical implementation of algorithms, shape optimization, large scale optimization, semi-infinite and nondifferentiable optimization with applications to engineering design, global optimizations. Offered in alternate years. (Same course as Electrical and Computer Science Engineering 257.)

258A. Optimization I (3) II. The Staff
Lecture—3 hours. Prerequisite: knowledge of FORTRAN or C. Modeling optimization problems existing in engineering design and other applications, optimality conditions, linear programming and unconstrained optimization (gradient, Newton, conjugate directions and minimax algorithms), convergence and rate of convergence, selected topics. Offered in alternate years. (Same course as Electrical and Computer Science Engineering 258A.)

***258B. Optimization II** (3) III. The Staff
Lecture—3 hours. Prerequisite: course 258A. Modeling constrained optimization problems existing in engineering design and other applications, optimality conditions, linearly and nonlinearly constrained optimization problems, projection, feasible directions and reduced gradient algorithms, interior point methods, Lagrangian theory, duality, augmented Lagrangians, sequential quadratic programming, selected topics. Offered in alternate years. (Same course as Electrical and Computer Science Engineering 258B.)

***259. Optimal Control, Theory and Algorithms** (3) I. The Staff
Lecture—3 hours. Prerequisite: graduate standing. Optimal control and calculus of variations; existence of solutions to optimal control problem; necessary conditions of optimality, Pontryagin maximum principle, Euler equation; sufficient conditions of optimality, Hamilton-Jacobi-Bellman equation, linear quadratic regulator problem; algorithms for unconstrained and constrained optimal control problems. Offered in alternate years. (Same course as Electrical and Computer Engineering 259.)

261A-261B. Lie Groups and Their Representation (3-3) II-III. The Staff
Lecture—3 hours. Prerequisite: courses 215A, 240A, 250A-250B. Mathematical theory of Lie groups and Lie algebras, including the classification of semi-simple Lie groups. Representations of Lie groups, weights and characters, the Weil character formulas. Infinite-dimensional Lie groups, Kac-Moody algebras and the Virasoro algebra. Offered in alternate years.

280. Topics in Pure and Applied Mathematics (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: graduate standing. Special topics in various fields of pure and applied mathematics. Topics selected based on the mutual interests of students and faculty. May be repeated for credit in different subject area.

290. Seminar (1-6) I, II, III. The Staff (Chairperson in charge)
Advanced study in various fields of mathematics, including the following: algebraic theory of semi-groups, control theory, mathematical logic, mathematical statistics, ordinary differential equations, partial differential equations, theory of distributions, and univalent functions. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Professional Course

390. Methods of Teaching Mathematics (3) I, II, III. The Staff
Lecture—1 hour; discussion—1 hour; laboratory—2 hours. Prerequisite: graduate standing. Practical experience in methods and problems of the teaching of mathematics at the university level. Includes discussion of lecturing techniques, analysis of tests and supporting material, preparation and grading of examinations, and related topics. Required of departmental teaching assistants. May be repeated for credit. (S/U grading only.)

Medical Microbiology

See Medicine, School of

Medical Pharmacology and Toxicology

See Medicine, School of

Medicine

See Medicine (School of); and
Medicine and Epidemiology
(Veterinary Medicine)

Medicine, School of

Gerald S. Lazarus, M.D., Dean of the School
James J. Castles, M.D., Executive Associate Dean
John R. Elliot, Assistant Dean
F. William Blaisdell, M.D., Acting Assistant Dean
Lindy Kumagai, M.D., Assistant Dean
Ernest L. Lewis, M.D., Associate Dean
Frank J. Loge, M.B.A., Associate Dean
Brian O'Neill, M.D., Assistant Dean
Donal A. Walsh, Ph.D., Associate Dean
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Roblee Allen, M.D., Assistant Professor (*Internal Medicine*)
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Sue Barton, Ph.D., Assistant Clinical Professor
(*Family Practice*)
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(*Internal Medicine*)
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Caroline Connelly, Ph.D., Assistant Adjunct Professor
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Nancy Field, M.D., Assistant Professor (*Obstetrics and Gynecology*)
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Paul G. Fitzgerald, Ph.D., Associate Professor
(*Human Anatomy*)
Neal Fleming, M.D., Ph.D., Assistant Professor
(*Anesthesiology*)
Mark P. Fletcher, M.D., Associate Professor
(*Internal Medicine*)
Neil M. Flynn, M.D., Professor (*Internal Medicine*)

- David Follette, M.D., Assistant Professor (*Surgery*)
 Garrett E. Foulke, M.D., Associate Professor (*Internal Medicine*)
 Jon Foy, M.D., Assistant Professor (*Anesthesiology*)
 Charles F. Frey, M.D., Professor (*Surgery*)
 William Fry, M.D., Assistant Professor (*Surgery*)
 Dennis Fung, Professor (*Anesthesiology*)
 Andrew J. Gabor, M.D., Ph.D., Professor (*Neurology*)
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 David R. Gandara, M.D., Associate Professor (*Internal Medicine*)
 Murray B. Gardner, M.D., Professor (*Pathology*)
 Michael Gazzaniga, Ph.D., Professor (*Neurology*)
 Eugenio Gerscovich, M.D., Assistant Professor (*Radiology*)
 Gary Gershony, M.D., Assistant Professor (*Internal Medicine*)
 M. Eric Gershwin, M.D., Professor (*Internal Medicine*)
 William Gilbert, M.D., Associate Professor (*Obstetrics and Gynecology*)
 Thomas Gilman, M.D., Assistant Clinical Professor (*Anesthesiology*)
 Boyd W. Goetzman, M.D., Ph.D., Professor (*Pediatrics*)
 Ellen Gold, Ph.D., Associate Adjunct Professor (*Internal Medicine*)
 Tzipora Goldkorn, Ph.D., Assistant Adjunct Professor (*Internal Medicine*)
 Mari Golub, Ph.D., Adjunct Professor (*Internal Medicine*)
 Michael Goodman, Ph.D., Adjunct Professor (*Internal Medicine*)
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Earl F. Wolfman, Jr., M.D., Professor Emeritus

Hiroshi Yamauchi, M.D., Professor Emeritus

Julian R. Youmans, M.D., Ph.D., Professor Emeritus

Admission Requirements and Professional Curriculum. Detailed information can be obtained from the School of Medicine. See also the School of Medicine section in the front portion of this catalog.

Courses in the School of Medicine

Curriculum for the School of Medicine

The curriculum for the M.D. degree at the University of California, Davis School of Medicine is a four-year program to provide comprehensive training for the practice of medicine. It offers a blend of basic science training and clinical experience with opportunities for research. While the first two years emphasize the basic science basis of medicine, the student is exposed even from the onset to questions of patient management, thus providing a natural transition from the entry pregraduate training into the clinical training of the final two years.

The first-year program is for three quarters, beginning in the Fall. The basic sciences (anatomy, physiology, biochemistry, histology, endocrinology, neurosciences, immunology, general pathology) are blended with social sciences (the behavioral aspects of medicine), and students are introduced to the art of communicating with patients, and emergency medicine. The second-year program is for four quarters, but with the Summer Quarter abbreviated to six weeks. The Summer Quarter provides a transition between basic and clinical sciences with the presentation of systematic pathology, and courses on the integumentary system and reproductive system. In the remaining three quarters, the students complete their training in basic sciences (pharmacology, microbiology) and are then, from an organ system approach, presented the pathophysiological basis of disease (endocrine, hematopoietic/lymphoreticular, gastrointestinal, nutrition, musculoskeletal, neuromuscular, respiratory, nephrology). During the second year, students continue training in physical diagnosis and are presented with issues in community health, occupational medicine, psychopathology, and human sexuality. The third-year program is comprised of required clerkship rotations in the clinical specialties: twelve weeks of surgery, twelve weeks of medicine, and eight weeks each of obstetrics/gynecology, pediatrics and psychiatry.

In the fourth year of the M.D. curriculum, flexibility is built in to allow students to begin to individualize their medical career. Twenty-four weeks of flexible clerkships include four weeks of neurology and/or neurosurgery, four weeks of ambulatory care, and sixteen weeks of clinical electives. Each student is required to take two-week clerkships in physical medicine and rehabilitation, ophthalmology, otolaryngology, and a two-week required experience in responsibilities of medical practice (medical ethics, jurisprudence, medical economics). The fourth year curriculum also allows for twelve weeks of undesignated time.

To satisfy the M.D. degree program, the student must successfully complete the required course work and clerkships. Students who enter the program with advanced training in one of the areas required for the program are permitted to substitute required courses with electives of equal credit. In addition to the fourth-year elective program available, there is some opportunity for selecting electives during the first two years, in particular during the interim period between the first and second years.

Coordination with other Advanced Degree Programs

The curriculum for the M.D. degree provides flexibility and encourages coordination with other advanced degree programs (Ph.D., M.S., M.A., and M.P.H.). These programs offer a wide breadth of study areas and draw upon the considerable expertise of the entire campus faculty. In addition, the UC Berkeley School of Public Health offers an M.P.H. program in conjunction with the M.D. program.

School of Medicine administrators enthusiastically support students interested in pursuing advanced degree programs. The dual-degree program for the M.D./Ph.D. is targeted to train physicians to meet, respond to and solve the broad diversity of problems and dilemmas facing current and future health care. Students are encouraged to seek degrees in any of the campuswide Ph.D. programs, including those in social sciences and humanities. The UCD School of Medicine awards two competitive fellowships each year to students enrolled in the M.D./Ph.D. program.

First-Year Required Courses

	UNITS
Quarter I: Fall	
Biological Chemistry 410A, molecular and cell biology.....	4.5
Family Practice 400A, introduction to patient evaluation.....	2
Cell Biology and Human Anatomy 400, developmental, gross and radiologic anatomy.....	9
Psychiatry 401, medicine and the mind.....	2
Quarter II: Winter	
Biological Chemistry 410B, cell biology and metabolism.....	3.5
Cell Biology and Human Anatomy 402, human microscopic anatomy.....	5
Human Physiology 400, human physiology.....	8
Family Practice 400B, introduction to patient evaluation.....	2
Quarter III: Spring	
Biological Chemistry/Human Physiology 418, mammalian endocrinology and homeostasis.....	4.5
Human Anatomy/Human Physiology 403, neurobiology.....	5
Medical Microbiology 480A, basic and medical immunology.....	2.5
Pathology 410A, General Systemic Pathology...	4.5
Family Practice 400C, introduction to patient evaluation.....	2

Second-Year Required Courses

Quarter IV: Summer	
Pathology 410B, General Systemic Pathology...	7.5
Obstetrics and Gynecology/Pediatrics 420, reproduction/genetics/perinatology.....	2
Dermatology 420, integumentary system.....	2
Internal Medicine 400A, physical diagnosis.....	1
Quarter V: Fall	
Medical Microbiology 480B, pathogenic microbiology.....	6.5
Internal Medicine 420A, hematopoietic and lymphoreticular system/nuclear medicine.....	5
Orthopaedic Surgery 420, musculoskeletal system.....	2.5
Medical Pharmacology and Toxicology 400A, Principles of Pharmacology A.....	2.5

Community and International Health/Internal Medicine 402, epidemiology/community health/occupational medicine.....2.5
 Internal Medicine 400B, physical diagnosis.....2

Quarter VI: Winter

Medical Pharmacology and Toxicology 400B, Principles of Pharmacology B6
 Internal Medicine 420C, respiratory system4
 Internal Medicine 420D, cardiovascular system ..3.5
 Neurology 420, clinical neurosciences4
 Psychiatry 403, psychopathology.....3.5
 Psychiatry 402, human sexuality.....1
 Internal Medicine 400C, physical diagnosis.....2

Quarter VII: Spring

Internal Medicine 420F, metabolic-regulatory system3.5
 Internal Medicine 420B, gastrointestinal system ..3
 Internal Medicine/Biological Chemistry 419, basic and clinical nutrition2
 Internal Medicine 420E, nephrology4
 Internal Medicine 400D, physical diagnosis.....2

NOTE: The Third and Fourth year programs are currently undergoing revision and changes may be implemented in the Summer, 1994.

Medical Sciences (MDS; core courses)

Third-Year Required Courses

Professional Courses

430. Required Surgery Clerkship (18) I, II, III, IV. The Staff
 Clinical activity—full time (eight weeks); lecture—8 hours total. Prerequisite: approval by Committee on Student Evaluation and Promotion. Restricted to medical students. Course consists of eight weeks of general surgery specialties and four weeks of orthopedics or urology. Core material is presented through seminars and lectures and reading assignments involving the workup and care of the surgical patient.

431. Medicine Clerkship (18) I, II, III, IV. Course Committee Chairperson
 Clinical activity—full time (12 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Two 6-week periods. Direct patient care situations under guidance of full-time or volunteer faculty member. Nights and weekend on-call. Completion of 24 full write-ups on patients for whom student will take special responsibility.

432A. Obstetrics-Gynecology Clerkship (12) I, II, III, IV. Course Committee Chairperson
 Clinical activity—full time (8 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Obstetric/neonatal/gynecologic experience in delivery room, nursery wards, operating room, clinics. One-third of time spent in gynecology, two-thirds of time in perinatology. Obstetrics, neonatology and continuing care of fetus-neonate emphasized in perinatal period. Seminars and conferences throughout period.

432B. Pediatric Clerkship (12) I, II, III, IV. Course Committee Chairperson
 Clinical activity—full time (8 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Two 4-week periods, one in inpatient rotation (UCD Medical Center or Travis AFB) and one in ambulatory experience (UCD Medical Center). Assumption of appropriate patient care responsibilities; participation in conference/rounds; and seminars during ambulatory rotation.

433. Clinical Clerkship in Psychiatry (12) I, II, III, IV. Course Committee Chairperson
 Clinical activity—full time (8 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Students assigned to various mental health clinical settings following intensive orientation program. Focus on treatment of psychiatric problems encountered by physician in

practice. Diagnostic, therapeutic, and interpersonal skills emphasized.

Fourth-Year Required Courses

440. Responsibilities of Medical Practice (3) II. Davidson and staff
 Lecture/discussion—60 hours total. Prerequisite: approval by Committee on Student Evaluation and Promotion. Students will address nonbiological components of the patient-physician relationship (medical ethics, medical jurisprudence, medical economics, alcoholism and drug abuse, etc.) and critically explore social, ethical and cultural issues arising in medical practice. (S/U grading only.)

Fourth Year Required Courses

Responsibilities of medical practice.....2 weeks
 Physical Medicine and Rehabilitation clerkship2 weeks
 Ear, Nose and Throat/Ophthalmology clerkships.....4 weeks

Fourth Year Flexible Clerkships

Neurology and/or Neurosurgery.....4 weeks
 Ambulatory Care.....4 weeks
 Clinical Selectives.....16 weeks

The fourth year curriculum also allows for twelve weeks of undesignated time (electives, interviews, free time, etc.)

Other Medical Sciences Courses (MDS)

Professional Courses

401. Applications of Computers to Medical Practice (2) I, II, III, IV. Huntley
 Autotutorial—2 hours. Prerequisite: enrollment in medical school. Proficiency in computer applications relative to practice of medicine, with emphasis on e-mail, literature searching, file transfer, and hospital information services. Course given on line, at home or in lab; time and place determined by student. (S/U grading only.)

450. Introduction to UCD Medical Center (1) III. The Staff
 Seminar—20 hours total. Prerequisite: second-year medical student. Designed to assist medical student in transition from classroom to hospital setting. (S/U grading only.)

480. Insights in Clinical Research (1) II. Walsh
 Lecture—1 hour. Prerequisite: medical students in good standing. Clinical research presented by School of Medicine faculty; overview of pertinent issues, including medical ethics, human subjects protocols, case control methods, etc. (S/U grading only.)

489. Directed Studies (9) IV. O'Grady
 Independent study—40 hours weekly. Prerequisite: individual directed studies in extended preparation for National Board Examination, Part I, and/or as required by Promotion Board. Independent studies to review material from Years I and II in the curriculum in preparation for taking National Boards in the fall, and for remediation course work directed by the Promotion Board. Students are expected to spend 8 to 12 hours per day on these studies. Faculty consultation and tutoring available on individual basis. (S/U grading only.)

495. Medicine Literature Review (1-9) I, II, III, IV. Walsh
 Discussion—3-27 hours. Prerequisite: medical student in good academic standing and permission of the Associate Dean of Curricular Affairs. Independent study: topics for selection include, but are not restricted to, medical ethics, economics and jurisprudence, culture and medicine, ethnicity and medicine, gender and medicine, history of medicine, health manpower, and medical education. A prepared paper on the selected topic will be required. (S/U grading only.)

Departmental Courses:

Anesthesiology (ANE)

Upper Division Course

192. Internship in Anesthesiology (1-6) I, II, III, IV. The Staff (Bennett, Kien)
 Internship—3 to 18 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in anesthesia and related fields. (P/NP grading only.)

Professional Courses

460. Anesthesiology Clinical Clerkship (3-18) I, II, III, IV. (Lamden in charge)
 Full-time clinical activity (3 full days per unit). Prerequisite: third- and fourth-year medical students. Provides experience in total anesthetic management including application of physiologic and pharmacologic principles to preoperative, operative and post-operative management of patients. Considers choice and management of general and regional anesthesia techniques, resuscitation, artificial ventilation, inhalation and fluid-electrolyte therapy and pain problems. Students electing portions of the course for credit must receive consent of instructor. Limited enrollment.

462. Airway and Mechanical Ventilation (3) I, II. Lamden
 Clinical activity—full time. Prerequisite: third- and fourth-year medical students. Introduces medical students to endotracheal intubation and airway management. Includes pharmacology of drugs used and basic principles of anesthesiology.

463. Medical and Surgical Pain Management (2) I, II, III, IV. Eisele Jr.
 Clinical activity—20 hours; lecture/discussion—1 hour. Prerequisite: medical students in good standing, with consent of instructor. Round mornings with Acute Pain Service (5 half days/week for 2 weeks.) Rounds are interactive and instructional for understanding acute pain and treatment regimes. Chronic Pain Clinic follows, to observe a wider range of pain conditions and management strategies. (S/U grading only.)

498. Individual or Group Study (1-5) I, II, III, IV. Eisele and staff
 Discussion—1-5 hours; laboratory—2-10 hours. Prerequisite: interns and residents with consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics.

499. Anesthesiology Research (4-18) I, II, III, IV. Gronert and staff
 Laboratory—12-54 hours. Prerequisite: third- or fourth-year medical students, advanced standing undergraduate and veterinary medicine students; or consent of instructor. Problems in clinical and/or laboratory research. (S/U grading only for medical students.)

Biological Chemistry (BCM)

Lower Division Course

92. Internship in Biological Chemistry (1-12) I, II, III, IV. The Staff
 Internship—3-36 hours; final report. Prerequisite: consent of instructor. Supervised work experience in biological chemistry and related fields. (P/NP grading only.)

Upper Division Courses

192. Internship in Biological Chemistry (1-12) I, II, III, IV. The Staff
 Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to internship by preceptor. Supervised work experience in Biological Chemistry and related fields. (P/NP grading only.)

198. Group Study (1-5) I, II, III, IV. The Staff
 Prerequisite: consent of instructor. For undergraduate students desiring to explore particular topics in depth. Lectures and conferences may be involved. (P/NP grading only.)

*Course not offered this academic year.

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

***209. Prostaglandins/Leukotrienes and Related Lipids** (2) II. Ziboh (Dermatology)
Lecture—2 hours. Prerequisite: Biochemistry 101A-101B or Physiological Sciences 101A-101B or Physiology 100A-100B. Oxidative desaturation/elongation of polyunsaturated fatty acids. Biosynthesis of prostaglandins/leukotrienes from polyunsaturated fatty acids. Chemistry, biochemistry, and metabolism. Nutritional regulation. Physiological/pathophysiological implications; pharmacological and clinical relevance. Offered in alternate years.

214. Molecular Medicine (1) II. Hanley
Discussion—1 hour. Prerequisite: course in biochemistry or the equivalent. Series of lectures on current topics of biochemistry related to medicine. Material covered stresses concepts derived from biochemical research which have some potential clinical relevance, and are intended to be of interest to medical students. (S/U grading only.) (Same course as 414.)

216. Protein Structure (3) II. Benisek
Lecture—3 hours. Prerequisite: Biochemistry 201A or consent of instructor. Course designed to acquaint students at graduate level with currently applied techniques employed in determination of protein structure and significant results derived from them. Techniques which will be presented include amino acid sequence analysis, three-dimensional structure determination by X-ray diffraction, and nuclear magnetic resonance spectroscopy. Offered in alternate years. (S/U grading only.)

***217. Molecular Genetics of Fungi** (3) II. Holland
Lecture—3 hours. Prerequisite: graduate standing in a biological science; Biochemistry 101B; Genetics 100, 102A; Botany 119; Plant Pathology 130, 215X; Microbiology 215 recommended. Advanced treatment of molecular biology and genetics of filamentous fungi and yeasts, including gene structure, organization and regulation; secretion; control of reproduction; molecular evolution; transformation; and gene manipulation. Offered in alternate years. (Same course as Plant Pathology 217.)

***222. Mechanisms of Translational Control** (2) II. Hershey
Lecture—1 hour; discussion—1 hour. Prerequisite: Biochemistry 201C or consent of instructor. Molecular mechanisms of protein synthesis and translational control in eucaryotic cells, with emphasis on mammalian cells and their viruses. An advanced graduate-level treatment of topics of current interest, with readings and discussion of primary papers from the literature. Offered in alternate years.

298. Group Study (1-5) I, II, III, IV. The Staff
Prerequisite: consent of instructor. For graduate students desiring to explore particular topics in depth. Lectures and conferences may be involved.

299. Research (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

410A. Molecular and Cell Biology (4.5) I. Matthews, Holland
Lecture—5 hours. Basic biochemistry of proteins and nucleic acids is presented, followed by molecular genetics, regulation of gene expression, enzymes and structural proteins. Applications to clinically relevant systems are emphasized, particularly sickle cell anemia, thalassemias, immunoglobulins and monoclonal antibodies, oncogenes, cell proliferation control.

410B. Cell Biology and Metabolism (3.5) II. Traut
Lecture—4 hours (for 9 weeks). Prerequisite: approval by Committee on Student Evaluation and Promotion. Introduction to transport of small molecules and ions across membranes is followed by study of energy metabolism and biosynthetic processes in humans. Membrane receptors are considered as they relate to basic metabolic processes. Correlations to human disease are made throughout.

414. Molecular Medicine (1) II. Hanley
Discussion—1 hour. Prerequisite: course in biochemistry or the equivalent. Series of lectures on current topics of biochemistry related to medicine. Material covered stresses concepts derived from biochemical research which have some potential clinical relevance, and are intended to be of interest to medical students. (S/U grading only.) (Same course as 214.)

418. Mammalian Endocrinology and Homeostasis (4.5) III. Walsh and staff
Lecture—4 hours; discussion—1 hour; student presentation. Prerequisite: approval by Committee on Student Evaluation and Promotion. Physiological and biochemical properties of the mammalian endocrine system both at the cellular and systemic level. Principles that regulate homeostasis, especially in organ-organ interrelationships, metabolites, and minerals. Reproductive endocrinology. (Same course as Human Physiology 418.)

419. Introduction to Clinical Nutrition (3) III. Halsted (Internal Medicine), Rucker, and staff
Lecture—5 hours; lecture/discussion—1.5 hours; laboratory/discussion—0.5 hour (for 4 weeks). Prerequisite: approval by Committee on Student Evaluation and Promotion. A 28-hour course that integrates basic and clinical concepts of human nutrition. The course emphasizes nutrient homeostasis and regulation and current perspectives on the role of nutrition in disease. Format is partly lectures, partly discussion/case study. (Same course as Internal Medicine 419.)

497T. Tutoring in Biological Chemistry (1-5) I, II, III, IV. The Staff
Tutoring—3-15 hours. Prerequisite: advanced standing or consent of instructor. Assist instructor by tutoring medical students in preparation for one of the departmental courses that is a component of the required curriculum of the School of Medicine. (S/U grading only.)

498. Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: medical students with consent of instructor. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: medical students with consent of instructor. (S/U grading only.)

Cell Biology and Human Anatomy (CHA)

Upper Division Courses

101. The Gross and Microscopic Structure of the Human Body (4) II.
Lecture—4 hours. Prerequisite: Biological Sciences 1A or 10; Physiology 2-2L or Biological Sciences 1B recommended. A study of the gross and microscopic structure of the human body with emphasis on function.

101L. The Gross and Microscopic Structure of the Human Body (2) II.
Laboratory—two 3-hour sessions. Prerequisite: course 101 (may be taken concurrently). Laboratory will be taught from projections, models and slides to give students the opportunity to learn structure from direct experience.

192. Internship in Morphology (1-12) I, II, III, IV. The Staff
Internship—3-36 hours; final report. Prerequisite: upper division standing; laboratory science experience including some chemistry; approval of project by preceptor prior to period of internship. Experience of supervised internship in research laboratories of members of the department. (P/NP grading only.)

197T. Tutoring in Cell Biology and Human Anatomy (1-5) II. The Staff
Discussion—1 hour; laboratory—6-9 hours. Prerequisite: completion of course 101 with a grade of B or better and consent of instructor. Provides laboratory instruction in gross and microscopic human anatomy, with small groups of undergraduates under the supervision of the instructor. (S/U grading only.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Discussion—1-10 hours. Prerequisite: consent of instructor. Directed reading, discussion, and/or laboratory experience on selected topics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200. Gross Anatomy (8) I. Erickson
Lecture—3.5 hours; discussion—1 hour; laboratory—10.5 hours. Prerequisite: graduate student status and consent of instructor. To provide students with a vocabulary of human body structure and to acquaint them with structural relationships through dissection and lecture and to introduce them to functional aspects of gross anatomy, particularly as regards anatomical problem solving.

202. Human Microscopic Anatomy (5) II. Fitzgerald
Lecture—3 hours; laboratory—6 hours. Examines the normal microscopic structure of the basic cells, tissues, and organs of the body. Lectures emphasize morphology and structure-function relationships. Accompanying laboratories involve analysis and identification of sectioned material at the light microscopic and ultrastructural levels.

203. Neurobiology (6) III. Vijayan
Lecture—5 hours; laboratory—3 hours. Prerequisite: consent of instructor. Gross and microscopic anatomy of the central nervous system; motor and sensory pathways; neurophysiology, and cognitive functions.

250. Biology of Neuroglia (2) III. Vijayan
Lecture/discussion—1.5 hours. Prerequisite: consent of instructor. The properties and functions of non-neuronal or neuroglial cells in the mammalian central nervous system with relevance to neuronal development, physiology and injury response. Offered in alternate years. (Same course as Neuroscience 250.) (S/U grading only.)

290. Seminar (1) I, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

290C. Research Group Conference (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: graduate student with research experience (may be taken concurrently); consent of instructor. Discussion of problems, progress and literature relevant to current research undertaken by laboratory groups in Human Anatomy. (S/U grading only.)

292. Fertilization and Gamete Literature Critique (1) I, II, III. Meizel
Discussion—1 hour. Prerequisite: consent of instructor. Critical evaluation of current journal articles dealing with cell biology and biochemistry of gametes and fertilization. Selected papers will be presented and discussed in detail by students and faculty. May be repeated for credit. (S/U grading only.)

298. Advanced Group Study (1-5) I, II, III, IV. The Staff
Prerequisite: consent of instructor.

299. Research (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

400. Developmental, Gross, and Radiologic Anatomy (9) I. Erickson and staff
Lecture—6 hours; laboratory—12 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Integrated presentation of developmental, gross, and radiologic anatomy. Four students are assigned to a cadaver and dissect the entire body. Embryology and radiology are correlated with the dissections. Embryology is covered from implantation to birth.

402. Human Microscopic Anatomy (5) II. Fitzgerald and staff
Lecture—3 hours; laboratory—6 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Examines the normal microscopic structure of the basic cells, tissues, and organs of the

body. Lectures emphasize morphology and structure-function relationships. Accompanying laboratories involve analysis and identification of section material at the light microscopic and ultrastructural levels.

403. Neurobiology (5) III. Vijayan

Lecture—4 hours; laboratory—3 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Physiology and anatomy of the normal human nervous system in an integrated format. Focus on gross and microscopic brain structure, functional neuroanatomy, and the physiology, biochemistry, and pharmacology of the nervous system. (Same course as Human Physiology 403.)

497T. Tutoring in Human Anatomy (1-5) I, II, III, IV. The Staff

Lecture—3-15 hours. Prerequisite: advanced standing or consent of instructor. Assist instructor by tutoring medical students in preparation for one of the departmental courses that is a component of the required curriculum for the School of Medicine. (S/U grading only.)

498. Advanced Group Study (1-12) I, II, III, IV. The Staff

Prerequisite: medical students, interns, and residents with consent of instructor. Directed reading and group discussion and/or laboratory experience on selected topics. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

Clinical Psychology (CPS)

Graduate Course

299. Research (1-12) I, II, III, IV. Steward

Prerequisite: graduate student in Clinical Psychology or consent of instructor. Individual or group research on selected topics. (S/U grading only.)

Community and International Health (CMH)

Lower Division Course

92. Internship in Community Health (1-12) I, II, III, IV. The Staff

Internship—3-36 hours. Prerequisite: lower division standing; consent of instructor. Students apply theory and concepts learned in the classroom through field work in a community health agency. (P/NP grading only.)

Upper Division Courses

101. Perspectives in Community Health (3) I, III. Gilmer

Lecture—3 hours. Prerequisite: undergraduate standing. Covers comprehensively the responsibilities, obligations, roles and professional activities of various health care disciplines in the community; provides students with perspectives on preventive medicine in society.

160. Health Education (1-5) I, II, III, IV. The Staff (Student Health Center)

Lecture—1-3 hours; laboratory—3-15 hours. Prerequisite: consent of instructor. Preparation for field work in the area of health education. Planning and presentation of programs on health issues. Peer counseling in the areas of sexuality and alcohol/drug abuse. (P/NP grading only.)

180. Aging and Health (3) III. Gilmer

Lecture—3 hours. Prerequisite: upper division standing and consent of instructor. Emphasis on nature and determinants of health in the elderly. Current social and personal strategies for enhancing and maintaining health in old age.

192. Internship in Community Health Practice (1-12) I, II, III, IV. The Staff

Internship—3-36 hours. Prerequisite: upper division and graduate students; consent of instructor. The student, through fieldwork in a community health agency, learns to apply theory and concepts learned in the classroom. (P/NP grading only.)

194. Practicum in Community Health Clinics (1-5) I, II, III, IV. Kumagai and Staff

Clinical activity—3-15 hours; written report. Prerequisite: upper division student standing. The undergraduate student, through active participation in the medical aspects of community health clinics, gains knowledge of their organization, administration, and problem solving capabilities of these primary care facilities. (P/NP grading only.)

195. International Health Care (1) I. Kizer

Lecture/discussion—1 hour. Prerequisite: one or more courses in community health, health policy, sociology, or international relations recommended. A forum for learning about current health issues and health care systems in other countries. Topics include health care for refugees, the impact of political strife on health, the health care professional in international settings. May be repeated for credit. (Same course as course 495.) (P/NP grading only.)

198. Study in Community and International Health (1-5) I, II, III, IV. The Staff

Prerequisite: undergraduate standing and consent of instructor. Study and experience for undergraduate students in any number of areas in community and international health. (P/NP grading only.)

199. Research in Community and International Health (1-5) I, II, III, IV. The Staff

Prerequisite: undergraduate standing; consent of instructor. Student will work with faculty member in areas of research interest, including but not limited to injury control, international health, health policy, occupational and environmental health, health promotion and wellness, women's health, and health demographics. (P/NP grading only.)

Graduate Courses

230. Wilderness and Expedition Medicine (3.5) II. Kizer

Lecture/discussion—15 hours; laboratory—5 hours (over a 2-week period). Prerequisite: graduate students in health or life sciences with consent of instructor. Review of major medical problems that occur in wilderness and backcountry settings, including hypothermia and frostbite, heat illness, animal attacks, arthropod and reptile envenomation, high altitude illness, diving and marine medicine, and wilderness rescue. (Same course as 430.)

294. Practicum in Community Health Clinics (1-5) I, II, III, IV. Kumagai

Clinical activity—3-15 hours. Prerequisite: open to all first- or second-year medical students, or graduate students with consent of instructor. Students are assigned to clinical settings which demonstrate ethnic, urban/rural or other related aspects of clinical community health. The students, through active participation in health care delivery, are able to relate conceptual with practical aspects of primary health care. (S/U grading only for graduate students.)

298. Study in Community and International Health (1-5) I, II, III, IV. The Staff

Prerequisite: graduate student in good academic standing and consent of instructor. Study and experience for graduate students in any number of areas in community and international health. (S/U grading only.)

299. Research in Community and International Health (1-12) I, II, III, IV. The Staff

Prerequisite: undergraduate standing; consent of instructor. Student will work with faculty member in areas of research interest, including but not limited to injury control, international health, health policy, occupational and environmental health, health promotion and wellness, women's health, and health demographics. (S/U grading only for graduate students.)

Professional Courses

421. Principles of Epidemiology, Occupational Medicine, and Geriatrics (2.5) I. Haan

Lecture—7.5 hours for 4 weeks; discussion—1.5 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Fundamentals of epidemiology and epidemiologic study design, including measures of morbidity, mortality, and risk. Occupational medicine component covers the evaluation of

occupational illness, and specific examples of occupational diseases. Geriatrics component covers the comprehensive geriatric assessment, treatment issues, and the long-term care system. (Same course as Internal Medicine 421.)

430. Wilderness and Expedition Medicine (3.5) II. Kizer

Lecture/discussion—15 hours (for two weeks); laboratory—5 hours (for two weeks). Prerequisite: fourth-year medical student; other graduate students in health or life sciences with consent of instructor. Review of major medical problems that occur in wilderness and backcountry settings, including hypothermia and frostbite, heat illness, animal attacks, arthropod and reptile envenomation, high altitude illness, diving and marine medicine, and wilderness rescue. (Same course as course 230.)

455. Multidisciplinary Clinical Preceptorship (4.5) IV. The Staff

Clinical activity—full time (3 weeks). Prerequisite: second-year student in good academic standing. Students will be introduced to basic principals of geriatric health care and provided with opportunities for clinical observation and experience in a variety of facilities that serve older adults. Multidisciplinary nature of geriatrics will be emphasized. (S/U grading only.)

460. Geriatrics in Community Health (6-12) I, II, III, IV. Gilmer

Discussion—4 hours; clinical activity—full time (4-8 weeks) clinical setting and community needs assessment. Prerequisite: fourth-year medical student. Opportunity to participate in state-of-the-art geriatric programs ranging from well elderly to severely infirm. Sites include Yolo, Sacramento, and Martinez counties.

461. Clerkship in Community Health Group Practice (3-9) I, II, III, IV. The Staff

Clinical activity—full time (2-6 weeks). Prerequisite: third- or fourth-year medical students. Overview of local community health in group practice situations. Students participate in treatment at several clinic sites in Yolo County. Topics include primary care, environmental health, maternal and child health, jail health, and preventive health care for the aged. (S/U grading only.)

465. Community Health Preceptorship (3-18) I, II, III, IV. Staff

Clinical activity—full time (2-12 weeks). Prerequisite: fourth-year medical students. Provides the opportunity, at the California Department of Health Services, to participate in ongoing investigations of current public health problems, i.e., birth defects, cancer control, diabetes, hypertension, injury control, infectious diseases, aging, Alzheimer's disease, and smoking and tobacco use control.

480. Senior Partnership (1-3) I. Gilmer

Clinical activity—3-9 hours. Prerequisite: first- or second-year medical student or consent of instructor. Introduction to concepts of geriatric health care. Students are matched with elderly for the community for a project on health and aging; field experiences in clinical geriatrics; attendance at SOM lectures concerning geriatrics or the elderly. (S/U grading only.)

495. International Health Care (1) I. Kizer

Lecture/discussion—1 hour. Prerequisite: medical student in good academic standing. A forum for learning about current health issues and health care systems in other countries. Topics include health care for refugees, the impact of political strife on health, the health care professional in international settings. May be repeated for credit. (Same course as course 195.) (S/U grading only.)

498. Study in Community and International Health (1-5) I, II, III, IV. The Staff

Prerequisite: medical students in good academic standing and consent of instructor. Study and experience for medical students in any number of areas in community and international health. (S/U grading only.)

499. Research in Community and International Health (1-9) I, II, III, IV. The Staff

Prerequisite: medical students with consent of instructor. Student will work with faculty member in areas of research interest, including but not limited to injury

control, international health, health policy, occupational and environmental health, health promotion and wellness, women's health, and health demographics. (S/U grading only.)

Dermatology (DER)

Upper Division Courses

192. Internship in Cutaneous Biology (1-4) I, II, III, IV. Isseroff
Internship—8-20 hours; final report. Prerequisite: upper division standing or consent of instructor. Approval of project prior to internship by preceptor. Supervised work experience involving research on the skin. (P/NP grading only.)

199. Special Study in Cutaneous Biology (1-4) I, II, III, IV. The Staff (Isseroff in charge)
Prerequisite: advanced undergraduate standing and/or consent of instructor. Special study by individual arrangement of specialized topics in biology of skin. Work may be assigned readings, laboratory research or a combination. (P/NP grading only.)

Graduate Course

299. Research in Cutaneous Biology (1-12) I, II, III, IV. The Staff (Isseroff in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Independent research in cellular and biochemical mechanisms of cutaneous biology and pathology. (S/U grading only.)

Professional Courses

420. Integumentary System (2) IV. Huntley and staff
Lecture/discussion—4 hours (for 6 weeks). Prerequisite: approval by Committee on Student Evaluation and Promotion. Covers cell biology, pathology, and physical diagnosis of the skin and is designed to prepare medical students for clinical service. Recognition of normal variations, and common or important dermatoses is emphasized. Patient demonstrations of select conditions are included.

460. Dermatology Clinical Clerkship (6) I, II, III, IV. Huntley
Clinical activity—40 hours for four weeks (inpatient/outpatient service). Prerequisite: completion of three years of medical school; or consent of instructor. Observation and participation in dermatology clinics/practice and participation in Ward Rounds and Dermatology Clinics at UCDC Medical Center, Kaiser, and private practitioner offices. Limited enrollment.

480. Insights in Dermatology (1-3) I, II, III, IV. Huntley
Clinical activity—3-9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Clinical experience limited to observation of delivery of dermatologic care and attendance at some conferences. (S/U grading only.)

498. Special Topics in Clinical Dermatology (1-6) I, II, III, IV. The Staff (Huntley in charge)
Independent study—3-18 hours. Prerequisite: medical students with consent of instructor. Individually arranged study of special topics in clinical dermatology determined by student and instructor. Assigned readings and/or clinical examination of selected patients. (S/U grading only.)

499. Research in Cutaneous Biology (1-12) I, II, III, IV. The Staff (Isseroff in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Research, either laboratory or clinical, on ongoing projects within the department under supervision of faculty. (S/U grading only.)

Family Practice (FAP)

Lower Division Course

192C. Health Science Clinic Practicum (2) I, II, III, IV.
Field work—in clinic setting. Prerequisite: consent of instructor. Field experience to expose lower division students to health-care delivery including: patient histories and physical examinations; health promotion and disease prevention; diagnosis and treatment of episodic, acute and chronic illness; basic laboratory

testing; and appropriate referral and follow-up. (P/NP grading only.)

Upper Division Courses

192A. Internship in Family Practice (1-12) I, II, III, IV. Davidson
Internship—3-36 hours. Prerequisite: upper division standing and consent of instructor. Work experience supervised in the Department of Family Practice. Upper division students provided an opportunity to acquire research experience in a clinical laboratory setting. (P/NP grading only.)

192C. Health Science Clinic Practicum (2) I, II, III, IV. Arevalo
Field work—in clinic setting. Prerequisite: upper division standing and consent of instructor. Field experience to introduce upper division students to health-care delivery including: patient histories and physical examinations; health promotion and disease prevention; diagnosis and treatment of episodic, acute and chronic illness; basic laboratory testing; and appropriate referral and follow-up. (P/NP grading only.)

195. Health Care to Underserved Populations (1) II. Nesbitt
Lecture—1 hour. Prerequisite: sociology, political science, or applied behavioral science background recommended, or registration in medical school. Discusses socio/cultural perspectives of underserved population in California impacting their health; roles of family/interpersonal relationships in making health care decisions; and clinician's perspectives in treating people of cultures which are unfamiliar and/or uncomfortable with Western medicine. (P/NP grading only.)

Graduate Courses

240A-240B-240C-240D-240E-240F. Clinical Preceptorship (2-7) I, II, III. Hess, De Amicis
Clinical activity—8-28 hours. Prerequisite: enrollment in the Master's Track of the FNP Certificate Program. Provides opportunity to acquire the skills and knowledge necessary to diagnose and treat patients of all ages in an ambulatory care setting under the supervision of a preceptor. (P/NP grading only.)

242A-242B-242C. Clinical Role Seminar (1-1-1) I, II, III. Hess, De Amicis
Seminar—1 hour. Prerequisite: enrollment in course 240 and in the Master's Track of the FNP Certificate Program. Course accompanies course 240 and provides a small group forum for students to explore role development and clinical management issues based on nursing theories and research. (P/NP grading only.)

252A. Nurse Practitioner Role Development (1) III. Hess
Seminar—1 hour. Prerequisite: B.S. degree in nursing and enrollment in the Master's Track of the FNP Certificate Program. Provides opportunity to discover strategies for promoting role development and role satisfaction via discussions of pertinent issues, theory and research.

252B. Nurse Practitioner as Leader (1) III. The Staff
Seminar—1 hour. Prerequisite: course 252A and enrollment in the Master's Track of the FNP Certificate Program. Critical analysis of theories, issues, and research related to nurse practitioner role development in primary care. Emphasis on leadership and entrepreneurial aspects of practice development, maintenance, and evaluation.

264. Psychosocial Concepts and Issues in Primary Care (1) II. Hess, De Amicis
Seminar—1 hour. Prerequisite: B.S. degree in nursing and enrollment in the Master's Track of the FNP Certificate Program. Examination of relevant psychosocial concepts and issues as related to primary care practice. Review of relevant research and theories related to psychosocial aspects of care of individuals in family-oriented primary care.

266A. Health Maintenance/Promotion (2) II. De Amicis
Lecture—2 hours. Prerequisite: B.S. degree in nursing and enrollment in the Master's Track of the FNP Certificate Program. Focuses on the health and wellness

of individuals throughout the lifespan. Critical analyses of nursing interventions in health promotion and maintenance based on nursing and other theoretical frameworks and research data are emphasized.

266B. Family Nursing Theory (2) III. The Staff
Lecture—2 hours. Prerequisite: course 266A and enrollment in the Master's Track of the FNP Certificate Program. Exploration of family theories as related to advanced primary care nursing practice.

266C. Family Nursing Interventions (2) I. Leveque
Lecture—2 hours. Prerequisite: course 266B and enrollment in the Master's Track of the FNP Certificate Program. Course integrates family theoretical and therapeutic concepts to focus on nursing assessment and intervention strategies for family problems in health and illness.

266D. Community Assessment and Intervention (2) II. Trolinger
Lecture—2 hours. Prerequisite: course 266C and enrollment in the Master's Track of the FNP Certificate Program. The relationship between advanced primary care nursing practice and community is explored. Community assessment and intervention strategies appropriate for the family nurse practitioner are presented.

Professional Courses

The following courses are for students enrolled in the Family Nurse Practitioner/Physician Assistant Program.

340A-340B-340C-340D. Clinical Preceptorship for FNP/PA Students (3-12) I-II-III-IV. Stewart, White
Clinical activity—8-40 hours. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program. Student spends 8-40 hours per week with an approved physician preceptor in patient care to develop clinical skills necessary to assess and manage patients with common medical problems seen in primary care and long-term care facilities.

341A-341B-341C-341D. Advanced Clinical Preceptorship for FNP/PA Students (3-12) I-II-III-IV. Moser
Clinical activity—8-40 hours. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program, and course 340A-340B-340C. Student spends 8 to 40 hours per week in an approved clinical setting to build on clinical skills in primary care learned in course 340A-340B-340C. Assessment and management of patients with complex and multiple problems. (P/NP grading only.)

343A-343B-343C-343D-343E-343F. Inpatient Clinical Experience for FNP/PA Students (5-5-5-5-5) I, II, III, IV. The Staff
Clinical activity—160 hours per quarter. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program; successful completion of course 340A-340B-340C. Student clerkship in the inpatient setting in Family Practice, Surgery, and medical/surgical subspecialty electives at UCDCM and/or affiliated institutions. Designed to expose the FNP/PA program student to inpatient management; acquaint student with FNP/PA role in inpatient setting. (P/NP grading only.)

345. Clinical Geriatrics (5) III. Trolinger
Clinical activity—15 hours. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program. Application of principles of geriatric care in the outpatient, nursing home, acute hospital, and community settings that provide services for the elderly, including visits to patients' homes. (P/NP grading only.)

350. Ethics and Trends in Health Care for FNP/PA Students (2) III. Trolinger
Lecture/discussion—2 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program. Trends and ethical issues in health care, review of the process and policies for ethical decision-making in patient care. These issues, trends, and processes will be related to the role of the Family Nurse Practitioner/Physician Assistant.

352A-352B. Professional Development of the Physician Assistant (1-1) III. The Staff
Lecture/discussion—1 hour. Prerequisite: registered student in the Physician Assistant Program. Study of

the role of the physician assistant and its historical evolution, and of the organizational responsibilities and legal considerations.

354A-354B-354C. Fundamentals of Primary Health Care for FNP/PA Students (5-5-4) I-II-III.
The Staff

Lecture/discussion—4-5 hours. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program. Study of anatomy and physiology, pathophysiology, diagnostic criteria, approaches to assess and manage common medical problems seen in primary health care.

355A-355B-355C. Advanced Principles of Health Care for FNP/PA Students (4-4-4) I-II-III. The Staff
Lecture/discussion—4 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program; course 354A-354B-354C. Study of anatomy and physiology, pathophysiology, diagnostic criteria and approaches to assess and manage patients with complex and/or multiple health care problems in primary care settings, and to learn the management of patients in inpatient settings.

356. Pharmacology for FNP/PA Students (4) II.
The Staff

Lecture/discussion—4 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program. Principles of pharmacokinetics and pharmacodynamics, the classifications of drugs and representative drugs within each class, and application of these principles to pediatric and geriatric patients, and to pregnant or lactating women.

***360A-360B-360C. Ethics and Trends in Health Care for FNP Students (1-1-1) I-II-III.** Mentink and staff

Lecture/discussion—1 hour. Prerequisite: registered student in the Family Nurse Practitioner Program or consent of instructor. The student will learn about trends and ethics in health care, and review process and policies for ethical decision-making in patient care. These issues, trends and processes will be related to the role of the Family Nurse Practitioner.

362A-362B. Professional Development of the Nurse Practitioner (1-1) III. The Staff

Lecture/discussion—1 hour. Prerequisite: registered student in the Family Nurse Practitioner Program. Study of the role of the nurse practitioner and its historical evolution, and of the organizational responsibilities and legal consideration.

364A-364B-364C-364D. Behavioral Science for FNP/PA Students (2-1-2-1) I-III-II-III. The Staff

Lecture/discussion—2-1-2-1 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program. Study of communication skills and interviewing techniques, of self-awareness and awareness of others, of assessment of patients' concerns and counseling skills to assist them to gain insight and reach their own solutions, of behavior modification concepts and techniques.

366A-366B-366C-366D. Family Practice and Community Health for FNP/PA Students (2-2-2-2) I, III, I, II. Trolinger, Stewart

Lecture/discussion—2 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program. Study of family dynamics, growth and development, health care in all age groups including special concerns in pediatrics and geriatrics, health promotion and disease prevention, and cultural and community needs and concerns.

399. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. Davidson

Prerequisite: consent of instructor. Flexibility to develop and pursue research and clinical interests to enhance education in Family Practice. (P/NP grading only.)

Professional Courses

400A-400B-400C. Introduction to Patient Evaluation (2-2-2) I, II, III. Callahan

Lecture/discussion—18 hours total; clinical activity—6 hours total; conference or laboratory—4-8 hours total. Using a problem-based format and simulated patients each student will practice dealing with communication problems and learn basic physical exam-

ination skills through small group interactions. A continuity preceptorship and introduction to emergency medicine will also be offered. (Deferred grading only, pending completion of sequence.)

401. Preceptorship in Family Practice (1-9) I, II, III, IV. Morgan

Preceptorship—part-time (one 4-hour day per week; 10 weeks) or full-time (40-hour week per 1.5 units; 4 to 6 weeks). Prerequisite: medical students with consent of instructor. Student preceptorship in family physician's office as an introduction to clinical medicine.

402. Introductory Medical Spanish (2) II, III. Meizel
Lecture/discussion—2 hours. Prerequisite: restricted to medical students in good standing. Teaches the vocabulary needed to conduct a basic history and physical examination in Spanish. (S/U grading only.) (Deferred grading only, pending completion of sequence.)

407. Davis Community Clinic (2) I, II, III, IV. Tanji
Clinical activity—5-6 hours. Prerequisite: second-year medical student in good academic standing. Students learn to diagnose and treat common medical problems as seen at a community clinic, under the direct supervision of a physician. (S/U grading only.)

434A-434B-434C-434D-434E-434F-434G-434H. Primary Care at Clinica Tepati (3-3-3-3-3-3-3-3) I-II-III-IV-I-II-III-IV. Arevalo

Clinical activity—four 8-hour days; group seminar/discussion—ten 1-hour sessions; training session/lecture—four 2-hour sessions. Prerequisite: first- and second-year (full-time) medical students with consent of instructor; pre-application processed. Exposure to episodic and acute disease; learn physical examination and taking a complete history; also learn immunization techniques, use of laboratory tests. Limited enrollment. (S/U grading only.)

435A-435B-435C-435D-435E-435F-435G-435H. Primary Care at Clinica Tepati (3-3-3-3-3-3-3-3) I-II-III-IV-I-II-III-IV. Arevalo

Clinical activity—four 8-hour days; group seminar/discussion—ten 1-hour sessions; training session/lecture—four 2-hour sessions. Prerequisite: third- and fourth-year (full-time) medical students with consent of instructor; pre-application processed. Counseling, diagnosis, and treatment of patients with chronic (long-term) and acute (short-term) disease under supervision of a physician. Exposure to other special health-care needs of ethnic groups, and poor people in general. (S/U grading only.)

440. Ambulatory Medicine Clerkship (6 or 12) I, II, III, IV. Morgan, Nesbitt

Clinical activity—full time (4 or 8 weeks). Prerequisite: third-year medicine clerkship. Ambulatory medicine experience in family practice setting. Acquisition of skills to evaluate and develop a treatment plan for patients with common medical problems seen by primary care physicians in the outpatient setting.

445. Sports Medicine from a Primary Care Perspective (6) I, II, III, IV. Tanji

Clinical activity—full time (4 weeks). Prerequisite: fourth-year medical student in good academic standing. Students spend full time in outpatient clinic settings in family practice, orthopaedic surgery, physical education, internal medicine, and a community private practice. Students learn principles and practice of sports medicine from a primary care perspective.

462. Family Practice Preceptorship (3-18) I, II, III, IV. Morgan

Clinical activity—full time (3 days per unit). Prerequisite: completion of third year of medical school or medical student with consent of instructor. Preceptorships with primary care physicians in a variety of settings. Involvement in direct patient care and daily activities under supervision of physician-preceptor.

463. Selected Readings in Family Practice (1-9) I, II, III, IV. The Staff

Discussion—3-27 hours. Prerequisite: medical students in good academic standing. Increase understanding of family practice through assigned reading and thorough discussion with faculty member.

468. Family Practice in a Foreign Culture (6-18) I, II, III, IV. Smilkstein

Clinical activity. Prerequisite: completion of third year in medical school. Visit a family practitioner in a foreign country (arranged in advance by Department), accompany and participate in clinic activities of preceptor and analyze and report characteristics of the practice.

469. Family Practice Clerkship (3-18) I, II, III, IV. Morgan

Clinical activity—full-time. Prerequisite: third- and fourth-year medical students with consent of instructor (third-year students may elect to enroll for second half of spring quarter). Involvement in comprehensive primary medical care of patients in a family setting and observe the team approach to health care.

480. Insights in Family Practice (1-3) I, II, III, IV. The Staff

Clinical activity—3 to 9 hours; required readings. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Exposure to family practice in outpatient clinical setting. Three to nine hours per week spent with a community physician preceptor who is a member of the clinical faculty. (S/U grading only.)

498. Directed Group Study in Family Practice (1-9) I, II, III, IV. The Staff

Discussion—3-37 hours. Prerequisite: medical students with consent of instructor. Directed study on selected topics relating to family medicine and primary health care delivery; visits to and written analysis of selected innovative health care programs. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff

Prerequisite: medical students with consent of instructor. Research in various aspects of the health care delivery system. (S/U grading only.)

Human Physiology (HPH)

Upper Division Courses

192. Internship in Human Physiology (1-12) I, II, III, IV. The Staff (Curry in charge)

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in physiology and related fields. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Curry in charge)

To be arranged. Prerequisite: consent of instructor. Directed reading, discussion and/or laboratory experience on selected topics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Curry in charge)

Laboratory—3-15 hours; undergraduate research project. Prerequisite: senior standing in biology, chemistry, physics, psychology, or engineering. (P/NP grading only.)

Graduate Courses

200. Human Physiology (6) II. Curry, Renkin, and staff

Lecture—48 hours total; discussion—12 hours total. Prerequisite: graduate standing and consent of instructor. General cellular and organ system physiology, including neural, cardiovascular, respiratory, gastrointestinal and urinary systems in the human. Lectures concurrent with course 400; research/discussion and laboratory/demonstration sessions, and examinations separate.

210. Advanced General Physiology (3) III. Curry, Cala

Lecture—3 hours. Prerequisite: Physiology 100B; Biochemistry 101B; Chemistry 107B; graduate standing and consent of instructor. Physicochemical basis of living systems with emphasis on membrane permeability characteristics at both the cellular and tissue level. Offered in alternate years.

231. Renal Physiology (3) I. Rabinowitz

Lecture—3 hours. Prerequisite: Physiology 112, 113 or the equivalent; graduate standing. Topics in mammalian renal physiology and related areas of bio-

logical transport, fluid and electrolyte homeostasis, comparative renal physiology, and pathophysiology of the kidney in man. Offered in alternate years.

250. Circulatory Transport and Fluid Exchange (3) I. Renkin

Lecture—2 hours; discussion—1 hour. Prerequisite: Physiology 112, 113 and 114, or courses 400, 403 and 418, or the equivalent; or consent of instructor. Lectures, assigned reading and discussion of principles of microcirculatory exchange; blood, interstitial fluid and lymph dynamics; regulation of plasma and interstitial fluid volume; disturbances of plasma and interstitial fluid exchange; fluid replacement. Offered in alternate years.

280. Pulmonary Function Evaluation (4) I, II, III. Cross

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 400 or the equivalent; consent of instructor. Clinical laboratory, physiological evaluations of pulmonary function. (Same course as 480.)

285. Peripheral Circulation (3) III. Gray/O'Donnell

Lecture—1 hour; discussion—2 hours. Prerequisite: Physiology 111A, 113; or course 200 and consent of instructor. Lectures and critical analysis of papers on peripheral vascular function, including: structure/function and pressure/flow relationships, innervation, receptor pharmacology, endothelial and smooth muscle interactions, signal transduction, ion transport, permeability, paracrine mediators and disease mechanisms. Offered in alternate years.

298. Group Study (1-5) I, II, III, IV. The Staff (Curry in charge)

Prerequisite: consent of instructor. For graduate students desiring to explore particular topics in depth. Lectures and conferences may be involved.

299. Research (1-12) I, II, III, IV. The Staff (Curry in charge)

Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

400. Human Physiology (8) II. Curry, Renkin, and staff

Lecture—6 hours; laboratory—6 hours. Prerequisite: consent by Committee on Student Evaluation and Promotion. General, cellular and systemic physiology of cardiovascular, respiratory, gastrointestinal and urinary systems.

403. Neurobiology (5) III. Vijayan, Carlsen, Watson

Lecture—4 hours; laboratory—3 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Physiology and anatomy of the normal human nervous system in an integrated format. Focus on gross and microscopic brain structure, functional neuroanatomy, and the physiology, biochemistry, and pharmacology of the nervous system. (Same course as Cell Biology and Human Anatomy 403.)

418. Mammalian Endocrinology and Homeostasis (4.5) III. Turgeon and staff

Lecture—4 hours; discussion—1 hour; student presentation. Prerequisite: approval by Committee on Student Evaluation and Promotion. Physiological and biochemical properties of the mammalian endocrine system both at the cellular and systemic level. Principles that regulate homeostasis, especially in organ-organ interrelationships, metabolites, and minerals. Reproductive endocrinology. (Same course as Biological Chemistry 418.)

480. Pulmonary Function Evaluation (4) I, II, III. Cross

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 400 or the equivalent; consent of instructor. Clinical laboratory, physiological evaluations of pulmonary function. (Same course as 280.)

497T. Tutoring in Human Physiology (1-5) I, II, III, IV. Curry

Tutoring—3-15 hours. Prerequisite: advanced standing or consent of instructor. Assist instructor by tutoring medical students in preparation for one of the departmental courses that is a component of the required curriculum of the School of Medicine. (S/U grading only.)

498. Directed Reading and Group Study (1-4) I, II, III, IV. Curry and staff

Discussion—2-8 hours. Prerequisite: medical student. Directed reading and discussion on selected topics in human physiology. (S/U grading only.)

499. Research (1-6) I, II, III, IV. Curry and staff

Prerequisite: medical students with consent of instructor. Laboratory investigation on selected topics. (S/U grading only.)

Internal Medicine (IMD)

Lower Division Courses

92. Internship (1-4) I, II, III, IV. Last

Internship—3-12 hours. Prerequisite: lower division standing and consent of instructor. Supervised internship in internal medicine and related fields. (P/NP grading only.)

98. Directed Group Study (1-2) I, II, III, IV. Last

Seminar—1-2 hours. Prerequisite: lower division standing and consent of instructor. Directed group study in medicine and related fields. (P/NP grading only.)

99. Undergraduate Research in Medicine: Molecular and Cell Biology (1-3) I, II, III, IV. Last

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

192. Internship in Internal Medicine (1-12) I, II, III, IV. The Staff

Internship—3-36 hours; final report. Prerequisite: upper division standing. Supervised work experience in internal medicine and related fields. (P/NP grading only.)

198. Internship (1-2) I, II, III, IV. Last

Seminar—1-2 hours. Prerequisite: consent of instructor. Directed group study in medicine and related fields. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: upper division standing; consent of instructor. (P/NP grading only.)

Professional Courses

401A-401B-401C-401D. Physical Diagnosis

Practicum B (1-2-2-2) I, II, III, IV. Bonekat
Fieldwork—2 hours; lecture—1 hour; laboratory/discussion—1 hour. Prerequisite: approval by Committee on Student Evaluation and Promotion. Provides students with an overall framework for performance of a history and physical exam and with identification of abnormal physical findings. (Deferred grading only, pending completion of sequence.)

419. Introduction to Clinical Nutrition (3) III. Halsted, Phinney, Rucker and staff

Lecture—5 hours; lecture/discussion—1.5 hours; laboratory/discussion—0.5 hours (for 4 weeks). Prerequisite: approval by Committee on Student Evaluation and Promotion. A 28-hour course that integrates basic and clinical concepts of human nutrition. The course emphasizes nutrient homeostasis and regulation and current perspectives on the role of nutrition in disease. Format is partly lectures, partly discussion/case study. (Same course as Biological Chemistry 419.)

420A. Hematology (4) I. MacKenzie

Lecture—4 hours (for five weeks); laboratory—6 hours; discussion—2 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Topics include normal hematopoiesis and basic disorders of blood cells, transfusion therapy, immunoglobulin disorders, and hemostasis. Laboratory exercises cover normal and abnormal blood cells and the interpretation of common laboratory tests and are staffed by clinical hematologists.

420B. Gastrointestinal System (3.5) III. Zeldis

Lecture/discussion—36 hours (over a 4-week period). Prerequisite: consent by Committee on Student Evaluation and Promotion. Basic pathophysiological principles of digestive diseases on which clinical concepts and judgements can be developed. Emphasis on pathophysiological basis of gastroenterological and

hepatic disorders, with case discussions and symposia presented to exemplify basic principles.

420C. Respiratory System (4) II. Lillington

Lecture—38 hours; discussion—10 hours (48 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Lectures, demonstrations and small group case discussions of respiratory pathophysiology. Includes review of certain clinical aspects of respiratory anatomy, physiology and pathology; introduction to diagnostic procedures; and description of the major respiratory diseases.

420D. Cardiovascular System (3.5) II. Laslett and staff

Lecture—28 hours; discussion—8 hours (36 hours total). Prerequisite: medical student and consent of Committee on Student Evaluation and Promotion; or graduate student and Animal Physiology 113, Human Physiology 200, or the equivalent, and consent of instructor. Introduction to principles of etiology, mechanisms, diagnosis and management of the major diseases of the cardiovascular system, including ischemic, valvular, hypertensive, cardiomyopathic, pericardial, and electrical disorders. Lectures and small group discussions are employed.

420E. Nephrology (2.5) III. Kaysen

Lecture—4 hours; laboratory—2 hours (over a 6-week period). Prerequisite—approval by Committee on Student Evaluation and Promotion. Fundamental aspects of (a) disorders of body water, electrolytes and acid/base balance; (b) major categories and mechanisms of parenchymal renal diseases; (c) urinary tract infections.

420F. Metabolic Regulatory System (3.5) III. Soeldner

Lecture—4 hours; discussion—2 hours (over 8-week period). Prerequisite: approval by Committee on Student Evaluation and Promotion. Basic understanding of pathophysiological processes in organs and tissues primarily involved in metabolic regulation and sufficient factual base so that clinical and laboratory findings, diagnosis, and elementary management of patients with endocrinological disorders can be rationalized.

421. Principles of Epidemiology, Occupational Medicine, and Geriatrics (2.5) I. Schenker

Lecture—7.5 hours for 4 weeks; discussion—1.5 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Fundamentals of epidemiology and epidemiologic study design, including measures of morbidity, mortality, and risk. Occupational medicine component covers the evaluation of occupational illness, and specific examples of occupational diseases. Geriatrics component covers the comprehensive geriatric assessment, treatment issues, and the long-term care system. (Same course as Community and International Health 421.)

440. Ambulatory Medicine Clerkship (3-12) I, II, III, IV. Fitzgerald

Clinical activity—full time (2 to 8 weeks). Prerequisite: third-year medicine clerkship. Two- to eight-week ambulatory medicine experience in an internal medicine setting. Acquisition of skills to evaluate and develop a treatment plan for patients with common medical problems seen by primary care physicians. Several sites are available.

461. Problems in Internal Medicine (6 or 9) I, II, III, IV. Laughlin

Clinical activity—full time (4 or 6 weeks). Prerequisite: satisfactory completion of third year of medical school; consent of instructor. Study of inpatients hospitalized on Medical Service. Experience in Internal Medicine at Woodland Clinic and Hospital. Daily rounds, mornings with instructor, Monday through Friday; afternoons patient assignments. Teaching conferences and combined radiology-pathology medicine seminars. Weekly allied specialty conference.

462. Externship in Medicine (1-21) I, II, III, IV. Fitzgerald and staff

Externship—full time (4, 8, or 12 weeks). Prerequisite: Medical Sciences 431; demonstrated ability to accept responsibility; consent of instructor. Student assumes role of acting intern and will be primary physician on

medical ward under direction of medical resident and staff. Responsibility for patients admitted to acting intern and take call every fourth-night. Also taken at Children's S.F. Hospital. Limited enrollment.

463. Acting Internship in Medicine Intensive Care Unit (MICU) (9) I, II, III, IV. Albertson

Clinical activity—full time. Prerequisite: completion of third year in medical school; consent of Director of MICU. At UCD Medical Center, student functions as acting intern on MICU service under direction of medical resident and staff. Responsibility for patients admitted to MICU. On call in hospital every third night. Limited enrollment.

498. Group Study in Internal Medicine (1-18) I, II, III, IV. The Staff (Silva in charge)

Prerequisite: consent of instructor. Special study for medical students which may involve laboratory or library research, ambulatory or inpatient care responsibility on campus, at UCD Medical Center or off campus by specific arrangement. (S/U grading only.)

Internal Medicine—Cardiology (CAR)

Upper Division Courses

192. Internship in Cardiology (1-12) I, II, III, IV. Longhurst and staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in cardiology. May be repeated for credit up to 12 units. (P/NP grading only.)

199. Cardiology Research (1-5) I, II, III, IV. The Staff
Prerequisite: consent of instructor. Special study by individual arrangement in cardiovascular medicine. Work will include directed readings, laboratory and discussions. (P/NP grading only.)

Graduate Course

220. Basic Science in Cardiology (1) III. Kaufman
Lecture—1 hour. Prerequisite: graduate or medical student status. Fundamentals underlying cardiovascular medicine. Including hemodynamics, neural control of the circulation, biochemistry and some experimental design and statistics. Experts in each of these fields will give current information in their areas. Offered in alternate years. (S/U grading only.)

Professional Courses

401. Clinical Cardiology Clerkship: Kaiser (3-18) I, II, III, IV. The Staff

Clinical activity (4 weeks)—8-12 hours (hospital); 1-5 hours (clinics). Prerequisite: third- and fourth-year medical students with advance approval by Division of Cardiology. Emphasis placed on history taking and physical examination of pediatric and adult patients with congenital and acquired cardiovascular disease. Hospital rounds in CCU and elsewhere. The roles of ECG, PCG, and cardiac fluoroscopy, etc., in office cardiology will be evaluated. May be repeated for credit. Limited enrollment.

460. Cardiology Clinical Clerkship (3-18) I, II, III, IV. The Staff

Clinical activity—full time (2-12 weeks). Prerequisite: Medical Sciences 431, third- and fourth-year medical students in good academic standing with consent of instructor. Participation with members of subspecialty consultation service in initial clinical evaluation, work-up, management, and follow-up of patients with cardiologic disorders. Two outpatient clinics per week. May be repeated for credit. Limited enrollment.

461. Management of Coronary Artery Disease: Coronary Care Unit (3-18) I, II, III, IV. The Staff

Clinical activity (inpatient service)—full time (2 or 4 weeks). Prerequisite: completion of second year of medical school and advance approval by Division of Cardiology. Research in laboratory and exercise testing to be determined by instructor. Current methods of clinical research involving certain aspects of diagnosis and treatment. Includes acute coronary care, hemodynamic monitoring, stress testing, cardiac catheterization, pathologic correlations and the modern approach to therapy, both medical and surgical,

based on pathophysiologic mechanisms. May be repeated for credit. Limited enrollment.

464. Preventive Cardiology (3-6) I, II, III, IV. Amsterdam

Seminar—2 hours (for 2-4 weeks); clinical activity—full time (2-4 weeks). Prerequisite: completion of third year of medical school. Clinical experience, weekly seminar and reading on primary and secondary prevention of cardiovascular disease. Will be carried out in Lipid and Hypertension Clinics, Exercise Laboratory, Cardiac Care Unit, Cardiac Catheterization, and Cardiac Surgery services.

480. Insights in Cardiology (1-3) I, II, III, IV. The Staff

Clinical activity—3-9 hours. Prerequisite: medical student in good academic standing and approval by Division of Cardiology. Students attend one or more cardiovascular medicine clinics: general, hypertension, arrhythmia. Introduction to the diagnosis/treatment of common cardiovascular problems. (S/U grading only.)

498. Special Group Study: EKG Unit (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Special study—2-week sessions. Prerequisite: medical students with advance approval by monthly attending faculty. Special group study in cardiology for medical students in EKG unit. May include lectures, directed reading, and/or discussion groups. May be repeated for credit. (S/U grading only.) Limited enrollment.

499. Research (1-12) I, II, III, IV. The Staff
Prerequisite: approval by Division of Cardiology. (S/U grading only.)

Internal Medicine—Clinical Nutrition and Metabolism (NCM)

Upper Division Course

192. Internship in Clinical Nutrition (1-12) I, II, III, IV. Halsted, Phinney, and staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in nutrition. May be repeated for credit up to 12 units. (P/NP grading only.)

Graduate Course

290C. Clinical Nutrition Research Conference (1) I, II, III. Halsted, Phinney, Davis

Seminar—1 hour. Weekly seminar presented by a graduate student, taking the form of research completed or in progress, topic review or journal review from current journal. (S/U grading only.)

Professional Courses

461. Nutrition Clinical Clerkship (3-18) I, II, III, IV. Halsted, Phinney, and staff

Lecture—2 hours; clinical activity—full time (2 to 12 weeks). In-depth experience in assessment and monitoring of nutritional support of adult patients at UCD Medical Center whose illnesses are complicated by malnutrition, and of patients attending the Nutrition Clinic with problems in under-nutrition due to various illnesses.

480. Insights in Clinical Nutrition (1-3) I, II, III, IV. Halsted, Phinney, and staff

Clinical activity—3-9 hours. Prerequisite: student in good standing; consent of instructor. Student will attend weekly clinical nutrition consult rounds (four evenings) and/or Nutrition Clinic (one day). Introduction to diagnosis and treatment of common nutritional problems. (S/U grading only.)

499. Research in Nutrition (9-18) I, II, III, IV. Halsted, Phinney, Davis

Prerequisite: medical student in good standing; consent of instructor. Participation in on-going clinical or basic nutrition research. Student may devise own project depending upon time commitments.

Internal Medicine—Emergency Medicine (EMR)

Upper Division Course

192. Internship in Emergency Medicine (1-12) I, II, III, IV. Derlet and staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in emergency medicine. May be repeated for credit up to 12 units. (P/NP grading only.)

Professional Courses

401. Preceptorship in Emergency Medicine (1-6) I, II, III, IV. Derlet

Conference—2-4 hours; clinical activity—4-10 hours; term paper/discussion—2-10 hours. Prerequisite: Family Practice 400A, 400B, 400C or consent of instructor based upon previous equivalent experience. A broad range of emergency medical problems and management styles will be demonstrated. Participation in history taking and physical examination, based upon student experience. Submission of a literature review of an Emergency Medicine topic is required. (S/U grading only.)

430. Introduction to Medical Toxicology (3) I, II, III, IV. Horowitz

Independent study—24 hours; lecture/discussion—4 hours; fieldwork—12 hours. Prerequisite: fourth-year medical student with consent of instructor. Student will become familiar with the resources available to manage exposure and poison cases. Hands-on training in the use of Poisindex[®] and computer database. Additional readings from medical literature will be required.

460. Emergency Medicine Clerkship (6) I, II, III, IV. Derlet and staff

Clinical activity—full time (4 weeks). Prerequisite: third or fourth year medical student; satisfactory completion of Internal Medicine or Surgery clerkship; consent of instructor. Clinical work at UCD Medical Center or other area hospitals' emergency departments will be supplemented by didactic sessions. Students will be assigned appropriate emergency patients and will examine diseases and treat those patients.

465. Acting Internship in Emergency Medicine (3-12) I, II, III, IV. Derlet

Lecture/discussion—4 hours; independent study—4 hours; clinical activity—40 hours. Prerequisite: fourth-year medical student, consent of instructor, and satisfactory completion of course 460. The student will be assigned clinical duties with the Emergency Department interns at UC Davis Medical Center. He/she will examine, diagnose and treat patients as a primary care physician under the guidance of a faculty member.

499. Research (6-18) I, II, III, IV. Derlet
Laboratory—40 hours; research—full time (4 to 12 weeks). Prerequisite: consent of instructor. Elective where topics may be selected in either basic or clinical research areas of Emergency and/or Critical Care Medicine. The goals will be tailored to each individual student. Enrollment requires prior discussion and consent of instructor.

Internal Medicine—Endocrinology and Metabolism (ENM)

Upper Division Course

192. Internship in Endocrinology (1-12) I, II, III, IV. Walter and staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in endocrinology. May be repeated for credit up to 12 units. (P/NP grading only.)

Graduate Course

299. Research (1-12) I, II, III, IV. The Staff (Walter in charge)

Prerequisite: consent of instructor. Endocrinology research. (S/U grading only.)

Professional Courses

460. Endocrinology Clinical Clerkship (5-18) I, II, III, IV. Walter and staff
Clinical activity (inpatient-outpatient service)—full time (3 days per unit). Prerequisite: Medical Sciences 431 and/or consent of instructor. Participation with members of subspecialty service in the initial evaluation, work-up, management and follow-up of patients with endocrinologic disorders. Both inpatient and outpatient experience. Limited enrollment.

480. Insights in Endocrinology (1-3) I, II, III, IV. Walter
Clinical activity—3-9 hours; oral presentation. Prerequisite: student in good academic standing and consent of instructor. First- or second-year students observe in morning Endocrine and Diabetes clinics and attend bi-weekly noon and afternoon endocrine conferences. They also give brief endocrine physiology oral presentation to the endocrine group. (S/U grading only).

499. Research (1-12) I, II, III, IV. The Staff (Walter in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Internal Medicine—Gastroenterology (GAS)**Upper Division Course**

192. Internship in Gastroenterology (1-12) I, II, III, IV. Trudeau and staff
Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in gastroenterology. May be repeated for credit up to 12 units. (P/NP grading only.)

Professional Courses

460. Clinical Clerkship (3-18) I, II, III, IV. Trudeau and staff
Clinical activity—full time (2 to 12 weeks). Prerequisite: completion of third-year of medical school. Work-up, manage, and follow-up new patients on active inpatient consulting service. Gastroenterology/Hepatology patients. Daily rounds with attending physician.

480. Insights in Gastroenterology (1-3) I, II, III, IV. Trudeau
Clinical activity—3-9 hours. Prerequisite: student in good academic standing and consent of instructor. To gain insight in clinical activities of Gastroenterology Division through attendance at any of the following: endoscopic procedures, ward rounds, outpatient clinic, and G.I. grand rounds. (S/U grading only.)

499. Research (1-12) I, II, III, IV. Pimstone, Trudeau, Prindville, Zeldis
Clinical activity: varied. Prerequisite: medical student status; consent of instructor. Part-time participation in active clinical and basic research projects. Some will involve both patient care and relevant laboratory procedures. Basic research includes liver metabolism, cancer markers, porphyrias diet and cancer, folate metabolism. (S/U grading only.)

Internal Medicine—General Medicine (GMD)**Upper Division Course**

192. Internship in General Medicine (1-12) I, II, III, IV. J. Robbins and staff
Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in general medicine. May be repeated for credit up to 12 units. (P/NP grading only.)

Professional Courses

440. Introduction to AIDS and Related Disorders (2) I, II, III, IV. Flynn
Clinical activity—30 hours; discussion—10 hours. Prerequisite: first and second year medical students in good academic standing and permission of instructor. This course familiarizes students with the diagnosis and treatment of individuals infected with the human immunodeficiency virus. Students will interview

patients, observe patient care and participate in ongoing clinic research as well as examine alternative life styles. May be repeated for credit. (S/U grading only.)

460. General Medicine Consults (1-18) I, II, III, IV. The Staff (Division Chief in charge)
Clinical activity (inpatient-outpatient service)—40 hours. Prerequisite: fourth-year medical students with consent of instructor; a general medicine clerkship. Supervised opportunity to see entire spectrum of medical problems encountered by a general internist. Student spends time in General Medicine Clinic and on the General Medicine Consult Service. Consultation Service is particularly concerned with medical evaluation of surgical patients. Limited enrollment.

471. Clinical Care of the HIV-Infected Patient (6-8) I, II, III, IV. Lawrence and staff
Clinical activity—full time (4-6 weeks). Prerequisite: successful completion of Medical Sciences 431. Participation in evaluation and management of HIV-infected individuals at all stages of their disease in both inpatient and outpatient settings. Includes consultations, attendance at HIV and infectious disease clinics and multidisciplinary conferences.

480. Insights in General Medicine (1-3) I, II, III, IV. Robbins
Clinical activity—one to nine 4-hour sessions; rounds—one to nine 2- to 4-hour sessions. Prerequisite: student in good academic standing and consent of instructor. Student will observe work-up, diagnostic evaluation and management of common general internal medicine problems in ambulatory and inpatient settings; be supervised by attending physician while attending General Medicine Clinic and/or Consult Rounds; and make brief presentations to consult service. (S/U grading only.)

499. General Medicine Research (1-18) I, II, III, IV. The Staff
Discussion—3 hours; clinical research—8-40 hours. Prerequisite: consent of instructor. The student will be involved in a clinical research problem within the areas, interest and expertise of members of Division of General Internal Medicine. Alternatively, the research effort will be directed toward investigation of a clinical problem of general medical interest.

Internal Medicine—Hematology-Oncology (HON)**Upper Division Course**

199. Research in Hematology-Oncology (1-5) I, II, III, IV. Powell and staff
Laboratory—hours variable. Prerequisite: upper division standing and consent of instructor. Experience in laboratory research. (P/NP grading only.)

Graduate Courses

298. Topics in Hematology (1-4) I, II, III, IV. Meyers and staff
Prerequisite: one year of graduate work and/or consent of instructor. Basic concepts of the physiology of the hematopoietic organ, the pathophysiology of hematopoietic disease, and concepts of therapeutics will be offered for study. The specific topics to be dictated by the interest and background of the students.

299. Research (1-12) I, II, III, IV. Meyers and staff
Prerequisite: consent of instructor. Laboratory investigation contributing to the dissertation for a graduate degree. (S/U grading only.)

Professional Courses

460. Hematology-Oncology Clinical Clerkship (6-18) I, II, III, IV. Meyers and staff
Clinical activity (inpatient-outpatient service)—full time (4-12 weeks). Prerequisite: Medical Sciences 431 and/or consent of instructor. Acting internship on inpatient Hematology-Oncology service. Participation with members of the subspecialty service in the initial clinical evaluation, work-up, management and follow-up of patients with hematologic or oncologic disorders. May be repeated for credit. Limited enrollment.

461. Ambulatory and Consult Clerkship (6-12) I, II, III, IV. Meyers and staff
Clinical activity—full time (4 to 8 weeks). Prerequisite: fourth-year medical student in good academic standing. Outpatient rotations include general hematology/oncology clinics, hemophilia clinic, sickle cell clinic, and two medical/surgical joint clinics. In addition, students will work on inpatient hematology and oncology consult service, the bone marrow service, and will attend all conferences sponsored by the Division.

462. Hematology-Oncology Clinical Clerkship (6-18) I, II, III, IV. Meyers and staff
Clinical activity (inpatient-outpatient service)—full time (4-12 weeks). Prerequisite: Medical Sciences 431 and/or consent of instructor. Clinical experience in hematology-oncology at the Sacramento VA Clinic with emphasis on evaluating new patients with anemia, coagulation disorders, reading bone marrows, and administering chemotherapy. Weekly tutorial sessions with faculty and attendance at division conferences. May be repeated for credit. Limited enrollment.

490. Practicum in Care for the Terminally Ill (6) I, II, III, IV. Meyers
Clinical activity—40 hours/week for 4 weeks. Prerequisite: fourth-year medical student and an interview with program Medical Director. Work with hospice team to gain experience in symptom relief, psychosocial care and bereavement counseling. A written report will be a major component used in grading. This course fulfills the Ambulatory Care requirement.

499. Research (1-12) I, II, III, IV. Meyers and staff
Prerequisite: consent of instructor. (S/U grading only.)

Internal Medicine—Infectious Diseases (IDI)**Upper Division Courses**

141. Infectious Diseases of Humans (1) I. Dandekar
Lecture—1 hour. Prerequisite: introductory knowledge in biology and chemistry recommended. Course integrates information on biological and molecular nature of the causative organism, modern diagnostics, treatment and prevention strategies, and the role of infectious diseases in contemporary society and throughout human history. (P/NP grading only.)

192. Research Internship in Internal Medicine (1-12) I, II, III, IV. Jordan and staff
Internship—3-36 hours; final report. Supervised work experience in the division of Infectious Diseases. Undergraduates will have an opportunity to acquire research experience in clinical settings. May be repeated for credit up to 12 units. (P/NP grading only.)

199. Infectious Diseases Research (1-5) I, II, III, IV. The Staff (Jordan in charge)
Prerequisite: chemistry through organic chemistry (in addition, physical and biochemistry preferred), biology through basic bacteriology (in addition, microbiology and immunology preferred); and consent of instructor. Discrete problem requiring reading and actual manual effort in solution will be assigned to each student. Progress and results will be reviewed at intervals with instructor and via seminar presentation. (P/NP grading only.)

Graduate Courses

280. Molecular Pathobiology for Diagnosis and Therapy of Human and Animal Diseases (3) III. Dandekar
Lecture—3 hours. Prerequisite: graduate standing. Presentation of molecular pathobiology of human and animal viruses. Emphasis on molecular diagnostics at cellular/tissue level, and therapy including vaccines and gene transfer using recombinant DNA technology.

299. Research in Infectious Diseases (1-12) I, II, III, IV. The Staff (Jordan in charge)
Prerequisite: consent of instructor. Laboratory investigation contributing to the dissertation for a graduate degree. (S/U grading only.)

Professional Courses

460. Infectious Diseases Clinical Clerkship (3-6) I, II, III, IV. Jordan

Clinical activity—full time (2-4 weeks). Prerequisite: successful completion of two years of study in an accredited medical school. In addition to seeing patients ill with infectious diseases regarding whom consultation has been requested, students will have laboratory experience in clinical microbiology. Students will also attend and participate in infectious diseases conferences and rounds. Limited enrollment with priority to third-year medical students.

499. Research Topics in Infectious Disease (2-12) I, II, III, IV. The Staff (Jordan in charge)

Prerequisite: successful completion of the first year of study in School of Medicine, graduate students (approved for graduate credit), and/or consent of instructor. Discrete problem requiring reading and actual manual effort in solution will be assigned to each student. Progress and results to be reviewed at intervals with instructor and via seminar presentation. (S/U grading only.)

Internal Medicine—Nephrology (NEP)**Upper Division Course**

192. Internship in Nephrology (1-12) I, II, III, IV. Kaysen and staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in nephrology. May be repeated for credit up to 12 units. (P/NP grading only.)

Professional Courses

460. Nephrology and Fluid Balance (6-12) I, II, III, IV. Kaysen and staff

Clinical activity—full time. Prerequisite: completion of third year of medical school; consent of instructor. Active participation in all inpatient/outpatient clinical activities, attendance at specific lectures and conferences at UCD Medical Center covering the field of nephrology and fluid-electrolyte disorders. Limited enrollment.

499. Research in Nephrology (3-18) I, II, III, IV. Kaysen

Prerequisite: individual arrangement and consent of instructor. Independent laboratory research on a specific problem related to biochemical or immunologic causes of renal disease and/or uremic disorders in humans or animals. (S/U grading only.)

Internal Medicine—Occupational and Environmental Health (OEH)**Upper Division Courses**

190C. Research Conference in Occupational and Environmental Health (1) I. Gold; II, Beaumont; III. McCurdy

Discussion—1 hour. Prerequisite: consent of instructor. Weekly conference on research problems, progress and techniques in occupational and environmental health. Critical discussion of recent journal articles. May be repeated for credit. (P/NP grading only.)

192. Internship in Occupational and Environmental Health

(1-12) I, II, III, IV. Schenker and staff
Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in occupational and environmental health. May be repeated for credit up to 12 units. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Professional Courses

466. Occupational and Environmental Medicine Elective (6-12) I, II, III, IV. Schenker
Clinical and laboratory experience—full time (4 to 8

weeks). Prerequisite: fourth-year student and consent of instructor. Participate in activities of Occupational and Environmental Health Unit. Major activity is involvement in an epidemiologic research project of the University. Also participate in Ambulatory Occupational and Environmental Medicine Clinic at UCD Medical Center. (S/U grading only.)

470. Clinical Selective in Occupational and Environmental Medicine (3) I, II, III, IV. McCurdy

Clinical activity—full time. Prerequisite: fourth-year medical students in good academic standing, with consent of instructor. Outpatient clinical experience in Occupational and Environmental Medicine at UCDMC and in local industries. Participants will gain experience in evaluating occupational and environmental medical conditions, use of medical literature resources, the worker's compensation system, and toxicological principles.

480. Insights in Occupational and Environmental Medicine (1-3) I, II, III, IV. Schenker

Clinical activity—3-9 hours; small research projects. Prerequisite: first- or second-year medical student in good standing; consent of instructor. Students will observe and participate in research and clinical activities in occupational and environmental medicine which include conferences, occupational and environmental medicine clinical activities and field visits. Students develop and present small individual research projects. (S/U grading only.)

499. Research (1-12) I, II, III, IV. Schenker and staff

Laboratory—40 hours; clinical activity—4 or 8 hours. Prerequisite: third- or fourth-year medical student or consent of instructor. Student participates in activities of Division of Occupational and Environmental Health. Major activity is involvement in an epidemiologic research project of the Division. Also participates in ambulatory Occupational and Environmental Medicine Clinic at UCD Medical Center.

Internal Medicine—Pulmonary Medicine (PUL)**Upper Division Course**

192. Internship in Pulmonary Medicine (1-12) I, II, III, IV. Albertson and staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in pulmonary medicine. May be repeated for credit up to 12 units. (P/NP grading only.)

Graduate Course

210. Grant and Scientific Paper Writing (1) I, II, III, IV. Last

Discussion—2 hours. Basics of scientific writing for grants and papers. Each student will prepare a grant or paper for critique and tutorial feedback.

Professional Courses

460. Pulmonary Clinical Clerkship (3-18) I, II, III, IV. Albertson and staff

Clinical activity—full time (2 to 12 weeks). Prerequisite: Medical Sciences 431. At UCD Medical Center participating and rounding with Pulmonary fellows and consultation staff. Also includes pulmonary function test interpretation, outpatient assignments in outpatient clinic and preparation and presentation of material at weekly conferences.

462. Pulmonary Clinical Clerkship (3-12) I, II, III, IV. Bonekat

Clinical activity—full time (2-8 weeks). Prerequisite: completion of second year of medical school and/or consent of instructor. Participation at the Sacramento VA clinic with members of the subspecialty service initial clinical evaluation, work-up, management, and follow-up of patients with pulmonary disorders. Includes experience in Pulmonary Function Laboratory, and pulmonary diagnostic processes. Limited enrollment.

480. Pulmonary-Critical Care Medicine Insights (1-3) I, II, III, IV. Albertson

Clinical activity—3-9 hours. Prerequisite: student in good academic standing and consent of instructor. Student will attend respiratory outpatient clinics and in-patient pulmonary consultation rounds and medical

intensive care rounds. Introduction to diagnosis and treatment of common pulmonary problems. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Cross in charge)

Prerequisite: consent of instructor. (S/U grading only.)

Internal Medicine—Rheumatology-Allergy (RAL)**Lower Division Course**

99. Directed Research in Immunology (1-5) I, II, III, IV. Gershwin

Laboratory—1-4 hours. Prerequisite: consent of instructor. Independent research will be encouraged in basic immunology, including the role of the cellular immune system in oncogenesis. (P/NP grading only.)

Upper Division Courses

192. Internship in Rheumatology-Allergy (1-12) I, II, III, IV. Gershwin and staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in rheumatology-allergy. May be repeated for credit up to 12 units. (P/NP grading only.)

199. Directed Research in Immunology (1-5) I, II, III, IV. Gershwin

Laboratory—1-5 hours. Prerequisite: consent of instructor. Independent research will be encouraged in basic immunology, including the role of the cellular immune system in oncogenesis. (P/NP grading only.)

Graduate Courses

281. Clinical Immunology and Immunopathology (4) III. Gershwin, Robbins

Lecture—4 hours. Prerequisite: Medical Microbiology 107 or Veterinary Microbiology 270, or consent of instructor. Descriptive analysis of animal and human pathologic processes that interact with the immune system. Emphasis on infections, genetics, transplantation, allergy and autoimmunity. Offered in alternate years.

298. Topics in Rheumatology and Clinical Immunology (1-5) I, II, III, IV. Gershwin

Laboratory—1-5 hours. Prerequisite: consent of instructor. Library and/or laboratory work as required. (S/U grading only.)

299. Research in Autoimmune Disease (1-12) I, II, III, IV. Gershwin

Laboratory—1-12 hours. Prerequisite: consent of instructor. Independent research will be encouraged in both animal models of human disease (including congenitally athymic [nude], asplenic, and New Zealand mice) and the cellular immune system of patients with systemic lupus erythematosus, Sjögren's syndrome, polymyositis and drug hypersensitivity. (S/U grading only.)

Professional Courses

460. Rheumatology Clinical Clerkship (1-18) I, II, III, IV. Leek and staff

Clinical activity (inpatient-outpatient service)—full time. Prerequisite: Medical Sciences 431 and consent of instructor. Participation with members of the subspecialty service in the diagnosis and therapeutic management of patients with rheumatologic diseases.

461. Allergy Clinical Clerkship (3-18) I, II, III, IV. Gershwin and staff

Clinical activity (inpatient-outpatient service)—full time (2 to 12 weeks). Prerequisite: completion of second year of medical school and consent of instructor. Student will work with practicing allergist in daily work with patients and participate in weekly allergy clinic and teaching conferences. Study of the literature. Will see patients with problems in clinical immunology, immunodeficiency, asthma, allergic rhinitis.

480. Insights in Rheumatology (1-3) I, II, III, IV. Leek

Clinical activity—3-9 hours. Prerequisite: student in good academic standing and consent of instructor. Participation in rheumatology consultation rounds, rheumatic disease clinics and conferences with

supervised readings in rheumatology. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Gershwin in charge)

Prerequisite: medical student with consent of instructor. Part-time participation in active clinical and basic research projects which can involve both patient care and relevant laboratory procedures. Students can gain experience in clinical medicine and clinical investigation. (S/U grading only.)

Medical Microbiology (MMI)

Upper Division Courses

107. Chemical and Cellular Immunology (4) II. Sci-biensi

Lecture—4 hours. Prerequisite: Biochemistry 101A, 101B or consent of instructor. Chemical and cellular basis of immunity: structure-function relationship of antigens, antibodies and their interactions; molecular basis of antibody diversity; cellular basis of immunity; immunochemical and cellular aspects of hypersensitivity; immunogenetics and regulation of the immune response. (Same course as 407.)

115. Ecological Parasitology (3) II. Theis

Lecture—3 hours. Study of mankind's influence on environmental factors, behavior, geography that effect the development and spread of parasitic agents.

116. Parasitology for Wildlife Biologists (2) III. Theis

Lecture—2 hours. Prerequisite: upper division standing in wildlife biology or biological sciences or ecology. Emphasis on the role diseases and parasites play in wildlife dynamics. Lectures on techniques of collection, preservation and methods of surveying wildlife for parasites and the pathogenesis, ecology and zoonotic potential of parasites encountered by wildlife biologists.

***130. Medical Mycology** (2) II. Pappagianis

Lecture—2 hours. Prerequisite: a course in pathogenic microbiology; consent of instructor. Various aspects of pathogenic fungi, particularly affecting humans, will be discussed including epidemiology, pathogenesis and pathology, diagnosis and therapy. Offered in alternate years. (Same course as 430.)

192. Internship in Medical Microbiology (1-12) I, II, III, IV. The Staff (Beaman in charge)

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work experience in medical microbiology and related fields. (P/NP grading only.)

198. Group Study in Medical Microbiology (1-5) I, II, III, IV. The Staff (Beaman in charge)

Hours to be arranged. Prerequisite: upper division standing and consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics. (P/NP grading only.)

199. Research in Medical Microbiology (1-5) I, II, III, IV. The Staff (Beaman in charge)

Prerequisite: upper division standing and consent of instructor. Individual research. (P/NP grading only.)

Graduate Courses

200D. Mechanisms for Microbial Interactions with Hosts (3) II. Beaman

Lecture/discussion—3 hours. Prerequisite: Microbiology 200A or consent of instructor. Study of mechanisms involved in microbial interactions within a host environment. The following principles are basic to understanding these interactions: host recognition, invasion, competition and growth, and host defense.

209. Current Immunology (2) I, II, III. Van de Water
Discussion—2 hours. Prerequisite: consent of instructor. Current developments in various aspects of immunology and their interrelationships. (S/U grading only.) (Same course as 409.)

***215. Medical Parasitology** (5) I. Theis

Lecture—3 hours; laboratory—6 hours. Prerequisite: graduate students with consent of instructor. Epidemiological, pathogenesis, diagnostic methods and laboratory studies of protozoa, helminths and arthropods of medical importance. Offered in alternate

years. (Same course as 415.)

220. Current Concepts in Bacterial Ultrastructure (2) III. Beaman

Discussion—2 hours; student presentations; term paper. Prerequisite: Microbiology 105 or consent of instructor. Critical evaluation of current literature dealing with all aspects of bacterial ultrastructure. Discussion of selected and assigned reading and formal student presentations of assigned topics.

298. Group Study in Medical Microbiology and Immunology

(1-5) I, II, III, IV. The Staff (Beaman in charge)

Prerequisite: consent of instructor; open to graduate students. Directed reading and discussion and/or laboratory investigation on selected topics. (Sections 1, 2, 4, 5: S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Beaman in charge)

Prerequisite: consent of instructor; open to graduate students. Laboratory investigation contributing to the dissertation for a graduate degree. (S/U grading only.)

Professional Courses

407. Chemical and Cellular Immunology (4) II. Sci-biensi

Lecture—4 hours. Prerequisite: medical student with consent of instructor. Chemical and cellular basis of immunity: structure-function relationship of antigens, antibodies and their interactions; molecular basis of antibody diversity; cellular basis of immunity; immunochemical and cellular aspects of hypersensitivity; immunogenetics and regulation of the immune response. (S/U grading only.) (Same course as 107.)

409. Current Immunology (2) I, II, III.

Discussion—2 hours. Prerequisite: consent of instructor. Current developments in various aspects of immunology and their interrelationships. (Same course as 209.)

***415. Medical Parasitology** (5) I. Theis

Lecture—3 hours; laboratory—6 hours. Prerequisite: medical student with consent of instructor. Approved for graduate degree credit. Epidemiological, pathogenesis, diagnostic methods and laboratory studies of protozoa, helminths and arthropods of medical importance. Offered in alternate years. (S/U grading only.) (Same course as 215.)

420. Current Concepts in Bacterial Ultrastructure (2) III. Beaman

Discussion—2 hours; formal presentation or term paper. Prerequisite: medical students with consent of instructor. Evaluation of current status of bacterial ultrastructure with an emphasis on host-parasite interactions through discussions and assigned readings. (S/U grading only.)

***430. Medical Mycology** (2) II. Pappagianis

Lecture—2 hours. Prerequisite: a course in pathogenic microbiology; consent of instructor. Various aspects of pathogenic fungi, particularly affecting humans, will be discussed including epidemiology, pathogenesis and pathology, diagnosis and therapy. Offered in alternate years. (Same course as 130.)

480A. Medical Immunology (2.5) III. Sci-biensi

Lecture—7 hours (four weeks only). Prerequisite: approval by Committee on Student Evaluation and Promotion. Presents the structure and function of the molecules, cells, and tissues involved in immunity, and their interactions in health and disease.

480B. Pathogenic Microbiology (6.5) I. Sci-biensi

Lecture—7 hours for 9 weeks; laboratory—20 hours per quarter. Prerequisite: approval by Committee on Student Evaluation and Promotion. The biology of pathogenic microorganisms with emphasis on their role in human disease.

497T. Tutoring in Medical Microbiology (1-5) I, II, III, IV. Beaman and staff

Tutoring—3-15 hours. Prerequisite: appropriate preparation in subject matter and consent of instructor. Assist instructor by tutoring medical students in one of the departmental courses that is a component of the required curriculum of the School of Medicine. (S/U grading only.)

498. Group Study in Medical Microbiology and Immunology (1-5) I, II, III, IV. The Staff (Beaman in charge)

Prerequisite: medical students with consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Beaman in charge)

Prerequisite: medical students with consent of instructor. (S/U grading only.)

Medical Pharmacology and Toxicology (PHA)

Lower Division Courses

92. Internship in Pharmacology (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Internship—3-36 hours; final report. Prerequisite: lower division student with good academic standing; approval of project prior to period of internship. Supervised work experience in pharmacology and related fields. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: lower division standing. (P/NP grading only.)

Upper Division Courses

100. Survey of Pharmacology (2) I. Hollinger

Lecture—2 hours. Prerequisite: introductory physiology or the equivalent, or consent of instructor. Survey of the principles underlying the action of drugs; consideration of the pharmacology of prescription and non-prescription drugs commonly used to treat medical conditions in children of school age; pharmacological aspects of drug dependency and related topics. Offered in alternate years.

192. Internship in Pharmacology (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work experience in pharmacology and related fields. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200A. Advanced General Pharmacology (3) I. Hance and staff

Lecture—3 hours. Prerequisite: upper division courses in biochemistry (101A-101B) and mammalian physiology (111A-111B and 112-113) or the equivalent. May be taken concurrently. Core course in human pharmacology designed for graduate and medical students. Principles in pharmacology, including pharmacokinetics and drug metabolism and the actions, use and toxicity of the major classes of drugs.

200B. Advanced General Pharmacology (4) II. Stark and staff

Lecture—4 hours. Prerequisite: upper division courses in biochemistry (101A-101B) and mammalian physiology (111A-111B and 112-113) or the equivalent (may be taken concurrently). Core course in human pharmacology designed for graduate and medical students. The actions, use and toxicity of major classes of drugs. Continuation of course 200A.

201. Pharmacology of the Nervous System: Transmitter Substances (2) I. Hance

Lecture—2 hours. Prerequisite: courses 200A-200B or 400A-400B, or the equivalent. Pharmacology of substances affecting nervous transmission. Offered in alternate years.

202. Pharmacology of the Nervous System: Hypnotics, Sedatives and Anesthetics (2) III. The Staff (Chairperson in charge)

Lecture—2 hours. Prerequisite: courses 200A-200B or

400A-400B, or the equivalent. Pharmacology of centrally-acting sedative, hypnotic, and anesthetic agents with emphasis on alterations in brain function. Offered in alternate years. (S/U grading only.)

203. Pharmacology of the Nervous System:

Stimulants and Anticonvulsants (2) II. Stark
Lecture—2 hours. Prerequisite: courses 200A-200B or 400A-400B, or the equivalent. Pharmacology of stimulant and convulsant agents, anticonvulsant agents and their evaluation in animal models. Offered in alternate years.

204. Pharmacology of the Nervous System: Drug Alteration of Behavior (1-3) II. K.F. Killam

Prerequisite: courses 200A-200B or 400A-400B, or the equivalent. Activity of drugs altering mood and behavior; psychopharmacologic agents, hallucinogens, antidepressants. Offered in alternate years.

206. Pharmacokinetics (2) I. Henderson

Lecture—2 hours. Prerequisite: courses 200A, 200B. Physicochemical and physiological factors affecting absorption, distribution, metabolism and excretion of drugs. Mathematical and graphical methods for determining pharmacokinetic parameters. Calculation of dose regimens. Offered in alternate years.

206L. Pharmacokinetics Laboratory (2) I. Henderson

Laboratory—6 hours. Prerequisite: course 206 (may be taken concurrently). Laboratory procedures for determining pharmacokinetic values in experimental animals. Exercises designed to follow subject matter sequence of course 206. Offered in alternate years.

208. Application of Computers to Pharmacology

(1) I, II, III. The Staff
Lecture—1 hour. Prerequisite: consent of instructor. Presentation of basic concepts and problems.

220. Statistical Approach to Pharmacological Research (2) III. Hance

Lecture—2 hours. Prerequisite: course 200A or consent of instructor. Introduction to application of statistics in pharmacological research and therapeutics, basic concepts of distributions, measures of location, dispersion and correlation, significance, probability, uncertainty, design of experiments.

297T. Tutoring in Pharmacology (1-3) I, II, III. The Staff (Chairperson in charge)

Tutorial—3-9 hours. Prerequisite: courses 200A-200B and 200AL-200BL, or the equivalent; consent of instructor. Under supervision of the instructor, students assist in preparation and teaching of courses in Pharmacology. (S/U grading only.)

298. Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor.

299. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

400A. Principles of Pharmacology (2.5) I. Hance and staff

Lecture—6 hours for 4 weeks; discussion—2 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Principles in pharmacology, including pharmacokinetics, drug metabolism and the actions, uses and toxicities of the major classes of drugs.

400B. Principles of Pharmacology (6) II. Stark and staff

Lecture—38 hours total; discussion—28 hours total. Prerequisite: consent of Committee on Student Evaluation and Promotion. The actions, uses and toxicities of the major classes of drugs. Continuation of 400A.

490. Seminar in Pharmacology for Medical Students (1) I, II, III, IV. The Staff (Chairperson in charge)

Seminar—1 hour. Prerequisite: consent of instructor. Seminar in pharmacology for medical students.

497T. Tutoring in Pharmacology (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Tutoring—3-15 hours. Prerequisite: advanced standing or consent of instructor. Assist instructor by tutoring medical students in preparation for one of the departmental courses that is a component of the

required curriculum of the School of Medicine. (S/U grading only.)

498. Special Study for Medical Students (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Lecture, directed reading, and/or discussion groups—3-15 hours. Prerequisite: consent of instructor. Special study in pharmacology for medical students. (S/U grading only.)

499. Directed Research for Medical Students (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Laboratory—3-36 hours. Prerequisite: consent of instructor. Directed research in pharmacology for medical students. (S/U grading only.)

Neurology (NEU)

Upper Division Course

199. Individual Special Study and Research (1-4) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Individual special study in neurophysiology and biomedical engineering is offered to qualified students. Studies on psychophysics, single-unit electrophysiology and instrumentation are offered in Davis. (P/NP grading only.)

Graduate Courses

201. Human Behavioral Neurobiology (2) I. Robertson

Lecture/discussion—2 hours. Prerequisite: Cell Biology and Human Anatomy 203; Psychology 108 or 136. Neurobiology of normal and abnormal behavior of humans, based on specific neuroanatomical, neurophysiological, and cognitive parameters. Evaluation of these parameters will be, for example, by application of clinical neurologic, neuropsychologic, and neuroimaging tests.

202. Visuomotor Neurobiology (2) III. Rafal

Seminar—2 hours. Prerequisite: course 201, Cell Biology and Human Anatomy 203. An overview of neural mechanisms of visually guided behavior in humans will examine the integration of visual attention and eye movements. Performance of normal humans and neurologic patients in reflexive orienting, visual search, reading and reaching will be considered. Offered in alternate years.

290. Seminar in Selected Topics (1) I, II, III, IV.

Gorin, Tait
Seminar—1 hour. Prerequisite: consent of instructor. Selected topics in Neuroscience will be offered. (S/U grading only.)

298. Group Study (1-5) I, II, III, IV. The Staff (Gabor in charge)

Prerequisite: consent of instructor. For graduate students desiring to explore particular topics in depth. Lectures and conferences may be involved. (S/U grading only.)

299. Individual Special Study and Research (1-12) I, II, III, IV. Staff (Richman in charge)

Laboratory—3-36 hours. Prerequisite: consent of instructor. Individual special study and research in Neurophysiology and Biomedical engineering is offered at both Davis and Sacramento Medical Center. (S/U grading only.)

Professional Courses

420. Clinical Neurosciences (4) II. Remler and staff

Lecture—6 hours; laboratory/discussion—5 hours (for five weeks total). Prerequisite: medical student with consent by Committee on Student Evaluation and Promotion. Lectures and case discussions of pathophysiology underlying neurological disorders including disorders of development, muscle, nerve, cerebral circulation, metabolism, myelin, cortical function, movement, cerebro-spinal fluid, autonomic function and special senses. Anatomical basis of clinical testing, nervous system infection, neoplasia and trauma will be discussed.

450. Clinical Neurology Clerkship (6) I, II, III, IV. Richman and staff

Clinic—full time (4 weeks at UCDMC). Prerequisite: fourth-year medical student. Essentials of a detailed neurological examination and principles of differential neurological diagnosis. Emphasis on common neurological disorders encountered in practice.

451. Clinical Neurology Clerkship (6) I, II, III, IV.

Remler and staff
Clinical activity—full time (4 weeks at Highland General Hospital, Oakland). Prerequisite: fourth-year medical student. Essentials of detailed neurological examination and principles of differential neurological diagnosis. Emphasis on common neurological disorders encountered in practice.

452. Advanced Clinical Neurology (6) I, II, III, IV. Richman and staff

Clinical activity—full time (4 weeks). Prerequisite: completion of four-week Neurology selective and consent of instructor. Extension of basic Neurology clerkship. Designed for students with special interest in medical disorders of nervous system. By arrangement with department, student may serve as an acting intern. Principles of neurological differential diagnosis and therapeutics emphasized.

453. Advanced Clinical Neurology (6) I, II, III, IV. Remler and staff

Clinical activity—full time (4 weeks at Highland General Hospital, Oakland). Prerequisite: completion of four-week Neurology selective and consent of instructor. Extension of basic Neurology clerkship. Designed for students with special interest in medical disorders of the nervous system. By arrangement with department, student may serve as an acting intern. Principles of neurological differential diagnosis and therapeutics emphasized.

454. Electroencephalography and Evoked Potentials (3-18) I, II, III, IV. Gabor, Seyal

Clinical activity—full time (2-12 weeks) technique and interpretation. Prerequisite: four-week Neurology clerkship and consent of instructor. Principles of electroencephalographic diagnosis including technical basis of electroencephalography and evoked potentials. Emphasis placed on how these studies are applied to neurological diagnosis.

455. Child Neurology (6) I, II, III, IV. Gospe

Clinical activity—full time (4 weeks). Prerequisite: satisfactory completion of Medical Sciences 431, 432A, and 432B and consent of instructor. Student exposed to children with disorders of the nervous system, both in outpatient and inpatient services. Cases presented to a member of full-time faculty who will discuss clinical findings, differential diagnosis, management and therapy. This course satisfies the fourth year neuroscience requirement.

456. Cortical Neurology (3-18) I, II, III, IV. Remler, Knight

Clinical neurological research—full time (12 weeks at Highland General Hospital, Oakland). Prerequisite: course 451 or the equivalent; consent of instructor. Student will pursue a small project in clinical neurologic research on higher cortical functions. The focus is on scientific analysis of behavior in disease states. Study may be arranged for from two weeks to twelve weeks, with units corresponding to length of course.

457. Special Topics in Neurology (3-18) I, II, III, IV. The Staff

Clinical activity—full time (2 to 12 weeks). Prerequisite: course 450, 451 or consent of instructor. Students study areas of special interest in tutorial manner under supervision of member of faculty with expertise and interest in elected field. Students may elect tutorial clinical experience with member of staff.

458. Introduction to Cognitive and Communication Disorders (3) I. Dronkers

Lecture—3 hours; observations, individual projects. Prerequisite: consent of instructor. Introduction to cognitive and communication disorders. Includes a survey of disorders subsequent to brain damage; management by neurology, neuropsychology, and speech pathology; and current research on appraisal, diagnosis, and treatment. Offered in the Martinez VA Medical Center. (S/U grading only.)

459. Independent Study in Neurogenic Communication Disorders (1-3) I, II, III, IV. Dronkers

Conference, observation and data collection—3-9 hours. Prerequisite: consent of instructor. Independent study of neurogenic communication disorders—aphasia, dementia, apraxia of speech, dysarthria. Designed for individual interest and includes discus-

sion, directed reading, research design, data collection, and preparation of results. Offered in the Martinez VA Medical Center. (S/U grading only.)

464. Clinical Neurology (3-18) IV, I, II, III. The Staff (Richman in charge)

Clinical activity—full time (minimum of one-half quarter). Prerequisite: fourth-year medical student or third-year medical student with completion of a medical clerkship; consent of Chairperson. Clerkship in neurology to be arranged at another institution with accredited residency programs in neurology under proper supervision.

468. Special Clinical Elective in Neurology (6-18) I, II, III, IV. The Staff

Clinical activity—full time (4 to 12 weeks). Prerequisite: fourth-year medical student or third-year medical student with clerkship in medicine and pediatrics. Emphasis will be on mastering the neurologic examination and on introduction to neurologic evaluation, diagnosis and therapy.

480. Insights in Neurology (1-3) I, II, III, IV. The Staff

Discussion—3 hours; clinical activity—3 to 9 hours. Prerequisite: student in good academic standing; consent of instructor. Attendance at neurology grand rounds and regular rounds following. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Richman in charge)

Laboratory—2-24 hours. Prerequisite: consent of instructor. Approved for graduate degree credit. Laboratory investigation on selected topics. (S/U grading only for graduate and medical students.)

Neurosurgery (NSU)

Upper Division Course

199. Special Study in Neurosurgery for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: advanced undergraduate standing with consent of instructor. Students may participate in ongoing neurosurgical projects or may pursue and design independent projects. (P/NP grading only.)

Graduate Course

299. Neurosurgery Research (3-12) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: graduate student with consent of instructor. Student may participate in ongoing neurosurgical projects or may pursue and design independent projects. (S/U grading only.)

Professional Courses

451. Neurosurgical Critical Care Clerkship (3) I, II, III. The Staff (Chairperson in charge)

Clinical activity—full time (2 weeks). Prerequisite: third- or fourth-year medical student having completed a neurosurgical clerkship or consent of instructor. Students participate in the care of neurosurgical patients in the NSICU and in the admission and surgical management of patients admitted through the Emergency Room.

455. Clinical Pediatric Neurosurgery (6) I, II, III, IV. Pang

Clinical activity—full time (4 weeks). Prerequisite: third- or fourth-year medical students who have satisfactorily completed course 460, consent of the instructor. Admission and follow-up of pediatric patients. Neurological history, examination, and diagnostic procedures are emphasized. Students will participate in surgical procedures and are required to attend all pediatric neurosurgery conferences.

460. Clinical Neurosurgery (6-18) I, II, III, IV. The Staff (Chairperson in charge)

Clinical activity—full time (3 days per unit; 4 weeks minimum). Prerequisite: third- and fourth-year medical students; consent of instructor. Approved for graduate degree credit. Admission and follow-up of patients. Neurological history, examination and further diagnostic procedures emphasized. Students participate in meaningful aspects of surgical procedures and attend listed conferences, rounds, and seminars.

464. Externship (6-18) I, II, III, IV. The Staff (Chairperson in charge)

Clinical activity—full time (4-12 weeks). Prerequisite: fourth-year medical student having completed a neurosurgical clerkship or consent of instructor. Clerkship in neurosurgery to be arranged at another institution with accredited residency program in neurosurgery under proper supervision.

470. Advanced Clinical Neurosurgery (6-18) I, II, III, IV. The Staff (Chairperson in charge)

Clinical activity—full time (4-12 weeks). Prerequisite: fourth-year medical student in good academic standing. Student will function as acting intern on neurosurgery service. Admission and management of patients. Neurological history, examination, diagnostic procedures, and surgical management are emphasized. Students participate in meaningful aspects of surgical procedures and attend required conferences and rounds.

480. Insights in Neurosurgery (1-3) I, II, III, IV. The Staff

Clinical activity—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Observation of neurosurgical care in emergency room, operating room and hospital floors, including manner of treatment of a variety of chronic and acute neurological diseases. (S/U grading only.)

499. Neurosurgery Research (1-18) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: medical student with consent of instructor. Student may participate in ongoing neurosurgical projects or may pursue and design independent projects. (S/U grading only.)

Obstetrics and Gynecology (OBG)

Upper Division Courses

190. Seminar in Early Mammalian Development

(1) I, II, III. Wiley
Seminar—1 hour; short paper. Prerequisite: Zoology 100 or the equivalent. Each student will present paper from the recent scientific literature on various research topics in early mammalian development. Short paper will be required at the end of course.

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates

(1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

290. Current Topics in Research (1) I, II, III, IV. The Staff

Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Selected topics in reproductive biology. (S/U grading only.)

291. Seminar in Early Mammalian Development

(1) I, II, III, IV. Wiley
Seminar—1 hour. Each student will be asked to present a paper from the recent scientific literature on various research topics in early mammalian development. Short paper will be required at the end of course.

298. Group Study (1-5) I, II, III, IV. Overstreet

Prerequisite: graduate standing; consent of instructor.

299. Research (1-12) I, II, III, IV. Overstreet

Prerequisite: graduate standing; consent of instructor. (S/U grading only.)

Professional Courses

***420. Reproductive System/Perinatology** (2) IV. Wiley

Lecture—3.5 hours (for 6 weeks). Introduction to clinical obstetrics and gynecology and perinatology as an extension of material introduced in the sciences basic to medicine in anatomy, reproductive physiology, and molecular biology/genetics. (Same course as Pediatrics 420.)

465. Elective Clerkship (4-18) I, II, III, IV. The Staff
Clinical activity—full time (3 days per unit). Prerequisite: third- and fourth-year medical student; Medical Sciences 432A (or the equivalent); consent of instructor. Active participation in inpatient and outpatient care. Attendance at specified conferences; student-faculty member informal conferences. May be repeated for credit.

470. Acting Internship in Obstetrics and Gynecology (6-8) I, II, III, IV. The Staff

Clinical activity—full time (4-6 weeks). Prerequisite: third- and fourth-year medical students who have completed Medical Sciences 432A; consent of instructor. Student will perform as intern and expect the following experience: Obstetrics and Gynecology, 2 weeks each; perform inpatient care; be on call every third night; attend scheduled conferences one half-day per week. Round daily with attending.

471. Ambulatory Gynecology and Obstetrics (6-8) I, II, III, IV. The Staff

Clinical activity—full time (4-6 weeks). Prerequisite: third- and fourth-year medical students who have completed Medical Sciences 432A; consent of instructor. Student to participate in following clinics each week: General Gynecology, New and Return Obstetrics, Post-Partum, High-Risk Obstetrics, Pre-Operative Clinic, other specialty clinics as assigned. Student will conduct examinations, present patients to staff and will be able to discuss treatment regimens. Night call in Labor and Delivery Suite every third night.

499. Research in Obstetrics and Gynecology (4-18) I, II, III, IV. The Staff

Prerequisite: medical student with consent of instructor. Student will pursue a research problem of her/his own choosing, selected with help of the faculty. Integration with ongoing faculty research projects recommended. (S/U grading only.)

Ophthalmology (OPT)

Upper Division Courses

192. Research Internship (1-12) I, II, III, IV. The Staff

Internship—3-36 hours. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in ophthalmology research. Research staff in Ophthalmology have programs in cell biology, electron microscopy, biochemistry, immunology and visual psychophysics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates

(1-5) I, II, III, IV. The Staff
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Course

299. Basic Research in Visual Science (1-12) I, II, III, IV. The Staff

Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

440. Ophthalmology Required Clerkship (3) I, II, III, IV. J. Brandt

Clinical activity—full time (2 weeks). Prerequisite: consent by Committee on Student Evaluation and Promotion. Fundamental knowledge of ophthalmic diagnosis and principles; basic ophthalmic instruments; understanding of treatment for eye problems manageable by a primary care physician; knowledge of what patients should be referred for ophthalmic care.

461. Basic Clinical Ophthalmology (4.5) I, II, III, IV. J. Brandt

Clinical activity—to be arranged (3 weeks). Prerequisite: medical students who have completed either Medical Sciences 430 or course 440 (in third or fourth year); consent of instructor. Provides an acquaintance with the fundamentals of routine clinical ophthalmology.

465. Advanced Subspecialty Ophthalmology (6 or 9) I, II, III, IV. Mannis, Keltner, J. Brandt

Clinical activity—to be arranged (4 weeks off campus or 6 weeks at UCD Medical Center). Prerequisite: medical students who have completed either

Medical Sciences 430 or course 440 (in third or fourth year); consent of instructor. Participation in disciplines of neuro-ophthalmology/pediatric ophthalmology, diseases of the cornea and external eye, glaucoma and retina. Rotations at UCD Medical Center may be arranged in 6-week units of one service alone, or in combination, as arranged with instructors.

480. Insights in Ophthalmology (1-3) I, II, III, IV. J. Brandt and staff

Clinical activity—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Clinical exposure in ophthalmology including slide-tape program, patient exposure, and department conferences (i.e., grand rounds and subspecialty conference). (S/U grading only.)

498. Group Study (1-3) I, II, III, IV. The Staff (J. Brandt in charge)

Prerequisite: medical students with consent of instructor. Directed reading and discussion. (S/U grading only.)

499. Research in Ophthalmology (1-12) I, II, III, IV. The Staff

To be arranged—3-36 hours. Prerequisite: medical students with consent of instructor. Individual research on selected topics in optics and visual physiology, cornea and external disease. (S/U grading only.)

Orthopaedic Surgery (OSU)

Lower Division Course

***99. Special Studies for Undergraduates (1-4)** I, II, III, IV. The Staff (Martin in charge)
Prerequisite: lower division standing and consent of instructor. (P/NP grading only.)

Upper Division Course

***199. Special Study for Advanced Undergraduates (1-5)** I, II, III, IV. The Staff (Martin in charge)
Prerequisite: upper division standing; consent of instructor. (P/NP grading only.)

Professional Courses

***421. The Musculoskeletal System (2.5)** The Staff
Lecture—5 hours for 5 weeks; laboratory/discussion—1 hour. Prerequisite: approval by Committee on Student Evaluation and Promotion. An introduction to the basic and clinical science of orthopaedic surgery and rheumatology.

428. Ambulatory Orthopaedics (3-6) I, II, III, IV. Matthews

Clinical activity—full time (2-4 weeks). Prerequisite: third- or fourth-year medical student in good standing and consent of instructor. Introduction to general orthopaedic problems and trauma and their management in an outpatient environment, including the emergency room. Students will conduct orthopaedic examinations, present patients to staff, and lead discussions of treatment regimens. Emphasis placed on orthopaedic physical exam and interpretation of x-rays.

462. Community Preceptorship (6) I, II, III, IV. Matthews

Clinical activity—full time (4 weeks). Prerequisite: third- or fourth-year student in good academic standing and consent of instructor. Designed to acquaint student with private practice of orthopaedics in the community setting. Opportunity to observe and assist private practitioners in office, emergency room and inpatient environment. Preceptorships available in Sacramento and surrounding areas. Student must provide own transportation.

464. Acting Internship (6) I, II, III, IV. Matthews

Clinical activity—full time (4 weeks). Prerequisite: third- or fourth-year student in good academic standing; and consent of instructor. Rotation designed to increase basic knowledge of musculoskeletal abnormalities at clinical level. Attention focused on selective case material. For those students who demonstrate proficiency, responsibility will be similar to that of intern.

480. Insights in Orthopaedic Surgery (1-3) I, II, III, IV. Szabo

Clinical activity—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Exposure to aims, methods and procedures in orthopaedic surgery via attendance at grand rounds, patient care conferences, and group discussions. (S/U grading only.)

481. History of Medicine for Medical Students (1.5) I. Benson

Lecture/discussion—2.5 hours (for six weeks). Prerequisite: third- or fourth-year students in the School of Medicine or second-year students with permission of Instructor of Record. Overview of the history of medicine throughout the world to introduce medical students to landmark accomplishments and key figures in the development of health care and to provide an expanded philosophical perspective on the ever-changing field of modern medicine. (S/U grading only.)

499. Orthopaedics Research (1-12) I, II, III, IV. The Staff (Rodrigo in charge)

Clinical activity—3 hours to full time (to be arranged with individual faculty). Prerequisite: third- or fourth-year student in good academic standing; consent of instructor. Laboratory or clinical investigation on selected topics. (S/U grading only.)

Otolaryngology (OTO)

Lower Division Courses

***192. Internship in Otolaryngology (1-12)** I, II, III, IV. Chairperson in charge

Internship—3 to 36 hours. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in otolaryngology and related fields. Final project report. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study in Otolaryngology for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: advanced undergraduate with consent of instructor. (P/NP grading only.)

Graduate Courses

290C. Research Conference in Otolaryngology (1) I, II. The Staff

Lecture/discussion—1 hour. Prerequisite: graduate students; medical students; advanced undergraduates with consent of instructor. Presentation and discussion of faculty and student research in otolaryngology. (S/U grading only.)

291. Principles of Speech, Hearing and Equilibrium (3) II. The Staff

Lecture/discussion—3 hours. Prerequisite: graduate students; medical students; advanced undergraduates with consent of instructor. Presentations by faculty and guest lecturers on anatomy, physiology, and behaviors involved in speech production, hearing, and equilibrium. Each student will be expected to make one class presentation.

298. Group Study (1-5) I, II, III, IV. The Staff (S/U grading.)

299. Individual Study in Otolaryngology for Advanced Graduate Students (1-12) I, II, III, IV. Chole and staff

Prerequisite: advanced graduate student with consent of instructor. (S/U grading only.)

Professional Courses

401. Clinical Examinations in Otolaryngology (1) I, II, III, IV. Chole

Lecture—1 hour; laboratory—1 hour; practical—1 hour total. Prerequisite: second-year medical students with consent of instructor; open to graduate students. Approved for graduate degree credit. Obtaining the history, applied anatomy of the regions, and the art of the examination. Head mirror required.

402. Otolaryngology in Family Practice (1) I, II, III, IV. Lecture—10 hours total. Prerequisite: fourth-year medical students and family practitioners with con-

sent of instructor; open to graduate students. Approved for graduate degree credit. Planned as a refresher course for those already possessing a background of knowledge in the specialty.

403. Basic Principles of Reconstructive Surgery (1) II. Donald

Lecture—four 2-hour sessions; laboratory—one 2-hour session (5 weeks). Prerequisite: third- or fourth-year medical student with consent of instructor. Formal presentations covering basic principles of reconstructive surgery, including wound healing, treatment of lacerations, skin and bone grafts, flaps, Z-plasties and revision of scars. Laboratory session utilizing animal tissues.

440. Otolaryngology Required Clerkship (3) I, II, III, IV. Brodie

Clinical activity—full time (2 weeks). Prerequisite: consent by Committee on Student Evaluation and Promotion. Provides fundamental knowledge of otolaryngologic diagnosis and principles, develops facility with basic Ear, Nose and Throat instruments, provides an understanding of treatment for ear, nose and throat problems manageable by a primary care physician, provides knowledge of what patients should be referred for otolaryngologic care.

460. Clinical Otolaryngology Elective (3-18) I, II, III, IV.

Clinical activity—full time. Prerequisite: third- and fourth-year medical students with consent of instructor; open to graduate students. Approved for graduate degree credit. Total involvement in clinical activities of the department.

480. Insights in Otolaryngology (1-3) I, II, III, IV. Brodie

Clinical activity—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Individualized activities (depending upon time available and previous exposure to Ear, Nose and Throat) including observing patient exams, ward rounds and attendance at lectures and grand rounds. (S/U grading only.)

***490. Journal Seminar (1)** I, II, III, IV. Donald, Chole
Lecture/discussion—10 hours total (course given three times per quarter). Prerequisite: fourth-year medical students with consent of instructor; open to graduate students. Approved for graduate degree credit. Monthly review of current otolaryngologic and related literature and recent advances.

498. Individual or Group Study (1-5) I, II, III. The Staff

Lecture/discussion—1-2 hours; laboratory—1-4 hours. Prerequisite: consent of instructor. Introduction to basic research in Otolaryngology. Lectures, discussion and laboratory study of sensory and motor systems. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff
Prerequisite: medical students with consent of instructor; open to graduate students. Approved for graduate degree credit. Participation in ongoing projects. (S/U grading only.)

Pathology (PMD)

Upper Division Courses

192. Internship in Human Pathology (1-12) I, II, III, IV. The Staff

Internship—3-36 hours; final project report. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in pathology and related fields. (P/NP grading only.)

199. Special Study in Pathology for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: advanced undergraduates and consent of instructor. (P/NP grading only.)

Graduate Courses

202. Current Topics in Tumor Biology (2) I, II, III, IV. Cardiff

Seminar—2 hours. Prerequisite: consent of instructor. Discussion of current topics in tumor biology by invited speakers and members of the class. A forum

for presentation of proposed and completed experiments by persons interested in tumor biology. (S/U grading only.)

207. Introduction to Nervous System Pathology

(1-4) I, II, III, IV. Ellis

Seminar—1-4 hours. Prerequisite: consent of instructor; open to advanced undergraduate, graduate, veterinary medical, and medical students. Study of nervous system tissue responses to injury, infection, neoplasia, and malformation in both the human and experimental animal. Seminars include correlation of clinical, gross and microscopic findings. Courses provide instruction in microscopic techniques.

210. Introduction to Human Pathology (4.5) III. C.

Miller

Lecture/discussion—8 hours; laboratory—4 hours (5 weeks). Prerequisite: graduate or upper division students with background in gross and microscopic anatomy, physiology and biochemistry. Lectures, laboratory, and computer-assisted learning. Introduces basic human disease processes. Stresses mastery of pathophysiology and vocabulary. Examining gross and microscopic tissue sections is taught. (Course given second five weeks of spring and taken with first-year medical students enrolled in course 410A.) Course not intended for veterinary medical or medical students.

298. Advanced Group Study (1-5) I, II, III, IV. The Staff

Staff

Prerequisite: consent of instructor.

299. Research (1-12) I, II, III, IV. The Staff

Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

404. Forensic Pathology (2) I, II, III, IV. Ellis

Laboratory—3-10 hours. Prerequisite: medical student or consent of instructor. Systematic study of current forensic cases with emphasis on differential diagnosis, preservation of evidence, and medicolegal procedures. Introduction to histopathologic diagnosis, ballistics, and toxicology. (S/U grading only.)

*405. Brain-Cutting Conference (1-4) I, II, III, IV. Ellis
Prerequisite: third- and fourth-year medical students or consent of instructor. Current specimens are sectioned, discussed, and clinical correlations proposed.

*407. Diseases of the Nervous System (1-3) I, II, III, IV. Ellis

Lecture—1 hour; discussion—1 hour; seminar—1 hour. Prerequisite: third- and fourth-year medical students or special training in pathology or neurological sciences; consent of instructor. Study of human nervous system reactions to disease including infection, neoplasia and maldevelopment; application of experimental models to human disease; and clinical correlations. Seminars emphasize microscopic findings in current cases; discussions include individualized experience in neuropathologic techniques. Given jointly with the Departments of Neurology and Neurosurgery.

*408. Anatomic Pathology Case Studies (1-12) I, II, III, IV. Ruebner

Discussion—1-4 hours; laboratory—3-24 hours. Prerequisite: medical student or consent of instructor. Participation and/or performance, under supervision, of complete autopsies and surgical pathology, with correlative discussion of clinical material, gross, microscopic and laboratory findings.

410A-410B. General/Systemic Pathology (4.5, 7.5) III-IV. Cardiff

Lecture—30, 30 hours total; laboratory/discussion—25, 90 hours total; autotutorial—0, 5 hours total. Prerequisite: approval by Committee on Student Evaluation and Promotion. In-depth study of disease and its causes related to the general mechanisms of disease and each of the specific human organ systems. Concepts of pathophysiology applicable and required for clinical diagnosis. (Deferred grading only, pending completion of sequence.)

464. Clerkship in Advanced Surgical Pathology

(6-12) I, II, III, IV. Lie

Clinical activity—full time (4-8 weeks). Prerequisite: third- or fourth-year medical student or consent of instructor. Designed to provide students with an inter-

sive experience in surgical pathology. Participation in grossing of specimens, preparation of frozen sections and slide reading sessions. Students attend surgical pathology conferences and seminar sessions in which clinical correlation and diagnostic information is discussed.

465. Applied Clinical Laboratory Medicine (6-9) II, III. Kost

Clinical activity—full time (4-6 weeks). Prerequisite: consent of instructor. Emphasis upon laboratory techniques, procedures, and interpretation of laboratory results. Students will be expected to participate fully and in all laboratory operations including bench techniques, laboratory management and quality control.

497T. Tutoring in Pathology (1-5) I, II, III, IV. The Staff

Tutoring—3-15 hours. Prerequisite: advanced standing or consent of instructor. Assist instructor by tutoring medical students in preparation for one of the departmental courses that is a component of the required curriculum of the School of Medicine. (S/U grading only.)

498. Advanced Group Study (1-5) I, II, III, IV. The Staff

Prerequisite: medical student and consent of instructor. Group study in variety of advanced topics in general, special, experimental, or comparative pathology. (S/U grading only.)

499. Research (1-18) I, II, III, IV. The Staff

Prerequisite: medical student with consent of instructor. Research in experimental, molecular, comparative, and applied pathology. Limited enrollment. (S/U grading only.)

Pediatrics (PED)

Upper Division Course

199. Special Study in Pediatric Research (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: undergraduate student with consent of instructor based upon adequate preparation as determined by instructor. (P/NP grading only.)

Graduate Course

299. Pediatric Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: graduate students who are candidates for a degree in some area of biology or behavioral sciences; consent of instructor. (S/U grading only.)

Professional Courses

401. Preceptorship in Pediatrics (2) I, II, III, IV.

Chairperson in charge

Preceptorship—half time. Prerequisite: second-year medical student or first-year medical student with consent of instructor. Opportunity to observe and participate in primary medical care in a practicing pediatrician's office. Participation in history-taking and physical examination will be at discretion of preceptor and dependent on student's experience. Evaluation by student.

402. Clinical Experience in Private Practice (1-18) I, II, III, IV. Chairperson in charge

Clinical activity—full time (2 to 12 weeks). Prerequisite: third- or fourth-year medical student; Medical Sciences 432B; consent of preceptor and Chairperson. Opportunity to participate in practice of preceptor, performing such tasks as history taking, physical examination, and patient management.

420. Reproductive System/Perinatology (2) IV. Oi

Lecture—3.5 hours (for 6 weeks). Introduction to clinical obstetrics and gynecology and perinatology as an extension of material introduced in the sciences basic to medicine in anatomy, reproductive physiology, and molecular biology/genetics. (Same course as Obstetrics and Gynecology 420.)

460A. Acting Internship: General Inpatient Pediatric Clerkship (6-18) I, II, III, IV. Halsted

Clinical activity—full time (4 to 12 weeks). Prerequisite: completion of Medical Sciences 432B with grade of B or better; letter of recommendation from Pediatrics faculty member. The Ward Acting Intern functions in a manner similar to that of a pediatric intern.

The Acting Intern takes admissions in the regular sequence and is expected to take night call. The Acting Intern can expect to manage between six and ten patients at a time. Limited enrollment.

460B. Acting Internship: Outpatient Pediatrics (6-18) I, II, III, IV. McCann

Clinical activity—full time (4 to 12 weeks). Prerequisite: completion of Medical Sciences 432B with grade of B or better; letter of recommendation from Pediatrics faculty member. Supervised experience in pediatric care on outpatient service at UCD Medical Center. Student functions as "Acting Intern" with appropriate supervision by residents and attending faculty. Limited enrollment.

461. Elective in Pediatric Hematology/Oncology

(3-18) I, II, III, IV. Ducore

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and management of hematologic disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

462. Elective in Pediatric Endocrinology (3-18) I, II, III, IV. Connors and staff

Clinical activity—full time (2 to 12 weeks). Prerequisite: completion of second-year study or the equivalent; consent of instructor. Inpatient and outpatient experience in diagnosis and management of endocrine disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

464. Acting Internship in Neonatology (6-18) I, II, III, IV. Merritt

Clinical activity—full time (4 to 12 weeks). Prerequisite: completion of Medical Sciences 432B with grade of B or better; letter of recommendation from Pediatrics faculty member. Diagnostic and therapeutic aspect of the medical and surgical high-risk neonate. Student expected to take night call. Limited enrollment.

465. Pediatric Specialty Clinic Elective (3-18) I, II, III, IV. McCann and staff

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Supervised experience in a variety of pediatric subspecialty clinics. Limited enrollment.

466. Elective in Pediatric Cardiology (3-18) I, II, III, IV. Parrish

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B. Inpatient and outpatient experience in diagnosis and management of cardiologic disorders in children. Laboratory experience and participation in clinical investigation may be arranged.

467. Elective in Pulmonary Medicine (3-18) I, II, III, IV. McDonald, Joad

Clinical activity—full time (2 to 12 weeks); daily rounds, two weekly half-day clinics. Prerequisite: pediatric clerkship. Inpatient and outpatient management of pediatric patients with pulmonary diseases. These will include but will not be limited to cystic fibrosis, asthma, and other forms of chronic pulmonary diseases as well as congenital abnormalities.

468. Elective in Pediatric Nephrology (3-18) I, II, III, IV. Makker

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and management of renal disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

469. Elective in Pediatric Infectious Disease (3-18) I, II, III, IV. Halsted

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and treatment of infectious disease of infants and children. Laboratory and clinical investigation may be arranged. Limited enrollment.

470. Elective in Pediatric Neurology (3-18) I, II, III, IV. Gospe

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 431, 432A, and 432B and consent of instructor. Inpatient and outpatient experience in diagnosis and management of neurological disorders in children. Students will also participate in other pediatric subspecialty clinics which serve children with neurological disorders. This course does not satisfy the fourth year neurology requirement. Limited enrollment.

471. Elective in Pediatric Gastroenterology (3-18) I, II, III, IV. Cannon

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and management of gastroenterology disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

476. Acting Internship in Pediatric Intensive Care (6-18) I, II, III, IV. Sheikb

Clinical activity—full time (4 to 12 weeks). Prerequisite: completion of Medical Sciences 432B with grade of A or consent of instructor of record; letter of recommendation from Pediatrics faculty member. Evaluation and support of critically ill infants and children. In general, student expected to take night call every third night during rotation. Limited enrollment.

***499. Research Topics in Pediatrics (1-18) I, II, III, IV. The Staff (Styne in charge)**

Prerequisite: student in Medical School with consent of instructor. Individual research project in pediatric subspecialty areas (cardiology, endocrinology, hematology, metabolism, newborn physiology and others) may be arranged with faculty member. Independent research by student will be emphasized and long-term projects are possible. (S/U grading only.)

Physical Medicine and Rehabilitation (PMR)**Upper Division Courses****198. Directed Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)**

Prerequisite: advanced standing and consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: advanced standing and consent of instructor. (P/NP grading only.)

Graduate Course***299. Research (1-12) I, II, III, IV. The Staff**

Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses**440. Rehabilitation Medicine Clerkship (3) I, II, III, IV. McDonald**

Clinical activity—full time (2 weeks). Prerequisite: Third- or fourth-year medical student; consent by Committee on Student Evaluation and Promotion. Rehabilitation medicine and geriatrics relating to comprehensive care of the physically disabled and the physical medicine management of neurologic and musculoskeletal disorders. Physiological effects, indications and contraindications of the therapeutic modalities and their application to common musculoskeletal disorders.

461. Rehabilitation Medicine Clinical Elective (5-18) I, II, III, IV. Kilmer

Clinical activity—full time. Prerequisite: completion of third year in Medical School; Medical Sciences 430, 431. Intended for non-UC medical students. Emphasis on evaluation of patients with neurological or orthopaedic problems requiring rehabilitative techniques for their management. Introduction to management of such patients. Fourth-year student may function as acting intern on Physical Medicine and Rehabilitation service.

462. Rehabilitation Medicine Clinical Elective (5-18) I, II, III, IV. Kilmer

Clinical activity—full time. Prerequisite: Medical Sci-

ences 430, 431; completion of third year in Medical School. Emphasis on evaluation of patients with neurological or orthopaedic problems requiring rehabilitative techniques for their management. Introduction to management of such patients. Physical Medicine and Rehabilitation at off-campus facility must be approved by Chairperson.

498. Advanced Group Study (1-5) I, II, III, IV. The Staff

Prerequisite: consent of instructor. Study and experience for medical students in any of a number of areas in physical medicine and rehabilitation. (S/U grading only.)

499. Research for Medical Students (1-12) I, II, III, IV. The Staff

Prerequisite: consent of instructor. Research on any of a variety of topics in physical medicine and rehabilitation. (S/U grading only.)

Plastic Surgery (PSU)**Professional Courses****460. Clinical Plastic Surgery Elective (1-18) I, II, III, IV. Stevenson**

Clinical activity—full time (approximately 40 hours per week). Prerequisite: third- or fourth-year medical students; Medical Sciences 430; consent of instructor. Total involvement in patient care involving surgical preparation, treatment, operative care, and follow-up. Developing and understanding reconstruction and aesthetic plastic surgery. Microvascular surgery included. Student rotation.

461. Dentistry for Future Physicians and Surgeons (6-8) I, II, III, IV. Thaller

Discussion-seminar—3 hours; laboratory—2 hours; clinic activity—full time (4-6 weeks). Prerequisite: third- or fourth-year medical students. General practitioners must recognize dental-related problems, have the ability to alleviate potential pain, and be able to refer these problems for further definitive evaluation and treatment. Students will have basic knowledge of dentistry; recognize potential dental problems; provide emergency care; have knowledge of where to refer these problems. (S/U grading only.)

Psychiatry (PSY)**Upper Division Courses****198. Directed Group Study (1-5) I, II, III, IV. The Staff (Servis in charge)**

Prerequisite: advanced standing and consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Servis in charge)

Prerequisite: advanced standing and consent of instructor. (P/NP grading only.)

Graduate Courses**226. Psychiatric Implications of Legal Intervention (2) I, III. Bauer**

Discussion—2 hours. Prerequisite: consent of instructor. The influence of laws on human behavior, and vice versa, will be explored. Particular emphasis on youth and juvenile court procedure. Moot court demonstrations.

298. Directed Group Study For Graduate Students (1-5) I, II, III, IV. The Staff (Servis in charge)

Prerequisite: graduate standing and consent of instructor.

299. Special Study for Graduate Students (1-12) I, II, III, IV. The Staff (Servis in charge)

Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Professional Courses**401. Medicine and the Mind: An Introduction to Psychiatry (2) I. Steward**

Laboratory/discussion—3 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Introduction to concepts and clinical applications of psychiatry throughout the human life cycle. Includes tutorials tailored to individual student interests which will explore the biological, psycholog-

ical, social, and cultural factors influencing health and illness. Includes lecture and video presentations as well as group discussion.

402. Human Sexuality (1) VI. Keasey

Lecture—2 hours; discussion—2 hours (4 weeks). Prerequisite: consent by Committee on Student Evaluation and Promotion. Normal and variant human sexuality. The focus will be on understanding human sexual function in health and illness. (S/U grading only.)

403. Psychopathology (3.5) VI. Nordahl

Lecture—6 hours; discussion—2 hours (5 weeks). Prerequisite: consent by Committee on Student Evaluation and Promotion. Introduction to basic aspects in mental/emotional dysfunction. Focus on understanding the development and symptomatology of major forms of psychiatric dysfunction.

412. Psychiatry Grand Rounds (1) II, III, IV. Maddock and staff

Lecture—1 hour. Prerequisite: medical students or staff or other qualified mental health professionals with consent of instructor. Weekly conference at UCD Medical Center for presentation of selected clinical cases, presentation of lecture and research reports.

413. Outpatient Psychiatry Clerkship (6-12) I, II, III, IV. Maddock and staff

Clinical activity—full time (4 to 8 weeks). Prerequisite: Medical Sciences 433 (Psychiatry Core Clerkship) and/or consent of coordinator. Experience in clinical management/treatment of adult outpatients with psychiatric and substance abuse disorders; crisis management/intervention, evaluation/development of diagnosis and treatment plan; emphasis on outpatient psychopharmacology/brief psychotherapy; observation of group therapy. Individual supervision by faculty/residents.

414. Consultation-Liaison Clerkship (6-12) I, II, III, IV. Maddock and staff

Clinical activity—full time (4 to 8 weeks). Prerequisite: Medical Sciences 433 (Psychiatry Core Clerkship) and/or consent of instructor. Student functions as member of the team in evaluation, management, and psychiatric liaison with other medical specialties. Intensive supervision from senior staff and psychiatric residents.

416. Child Psychiatry Clerkship (6-12) I, II, III, IV. Maddock and staff

Clinical activity—full time (4 to 8 weeks). Prerequisite: Medical Sciences 433 (Psychiatry Core Clerkship) and/or consent of instructor. Didactic and clinical inpatient, outpatient, and consultation-liaison experiences with children, adolescents and families. Clinical observations, diagnostic assessment, and treatment will be undertaken with close supervision. Literature review and case conferences presented on a regular basis.

417. Jail Psychiatric Clerkship (6 or 12) I, II, III, IV. Maddock and staff

Clinical activity—full time (4 to 8 weeks). Prerequisite: Medical Sciences 433 (Psychiatry Core Clerkship) and/or consent of course coordinator. Students gain experience, under close faculty supervision, assessing acute and chronic mentally ill inmates in both inpatient and clinic settings.

418. Off-Campus Clinical Experience (6-12) I, II, III, IV. Maddock and staff

Clinical activity—full time (4 or 8 weeks). Prerequisite: fourth-year medical students; consent of instructor. Clinical or research elective in off-campus medical school or mental health setting. To be arranged with advanced approval of instructor and individual in charge of off-campus setting.

420. Acting Internship in Psychiatry (6-12) I, II, III, IV. Maddock and staff

Clinical activity—full time (4 to 8 weeks). Prerequisite: Medical Sciences 433 (Psychiatry Core Clerkship) and/or consent of course coordinator. Acting intern position with close faculty supervision with emphasis on biological psychiatry, psychopharmacology and psychodynamic aspects appropriate to diagnostic and long-term patient management.

422. Readings in Psychiatry (1-3) I, II, III, IV. Maddock and staff

Readings—discussion—3 to 9 hours. Independent reading of a selected topic in psychiatry. Supervision and discussion with a psychiatry faculty member. (S/U grading only.)

480. Insights in Psychiatry (1-3) I, II, III, IV. Maddock

Clinical activity—3–9 hours. Prerequisite: first- or second-year medical student in good academic standing; consent of instructor. On individual basis, student provided with an opportunity for gaining insight into various clinical activities in the practice of psychiatry. (S/U grading only.)

498. Directed Group Study (1-5) I, II, III, IV. Servis and staff

Prerequisite: consent of instructor. Approved for graduate degree credit. Medical students desiring to explore particular topics in depth. (S/U grading only for graduate or medical students.)

499. Research (1-12) I, II, III, IV. Maddock and staff
Prerequisite: consent of instructor. Approved for graduate degree credit. Individual research on selected topics or research projects. (S/U grading only for graduate or medical students.)

Radiation Oncology (RON)**Graduate Course**

299. Independent Study and Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: enrollment with Biophysics Group for Ph.D. candidacy, and consent of group adviser and sponsor. (S/U grading only.)

Professional Courses**463. Radiation Oncology Clerkship** (3-9) I, II, III, IV. Castro, Ryu, Wilder

Clinical activity—full time (2-6 weeks). Prerequisite: completion of Medical Sciences 430, 431; third-year clinical clerkship, consent of instructor required. Introduction to radiation oncology. Students will participate in workup and treatment planning for radiation oncology patients and will be introduced to the concepts involved in clinical radiation oncology, radiation biology, and radiation physics.

498. Group Study in Therapeutic Radiology (1-12) I, II, III, IV. The Staff.

Prerequisite: consent of instructor. Approved for graduate degree credit. (S/U grading only for medical students.)

499. Research in Therapeutic Radiology (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Approved for graduate degree credit. (S/U grading only for medical students.)

Radiology—Diagnostic (RDI)**Professional Courses****413. Radiological Diagnosis II (Physics of Diagnostic Radiology)** (5) I. Seibert, Boone

Lecture—49 hours total; laboratory—6 hours total. Prerequisite: consent of instructor. Physics of diagnostic imaging; x-ray production and interaction; image formation; modulation transfer function; fluoroscopy; cine fluoroscopy; stereoscopy; xeroradiography; computerized and geometrical tomography; magnetic resonance and ultrasound. Principles of radiation protection in imaging will be covered. Offered at UC Davis Medical Center. Offered in alternate years. (S/U grading only.)

414. Medical Radiation Biology (3) III. Bushberg
Lecture—27 hours total. Prerequisite: consent of instructor. Medical radiation biology; molecular cellular and organ system response to acute and chronic irradiation; radiation carcinogenesis and genetic effects; radiation risk assessment; diagnostic ultrasound and magnetic resonance imaging health effects. Medical/legal considerations of radiation exposure. Offered at UC Davis Medical Center. Offered in even numbered years only. (S/U grading only.)

***415. Radiopharmacy** (3) III. Vera

Lecture—3 hours. Prerequisite: consent of instructor. Fundamentals of radiopharmaceutical science including radiochemistry; radiopharmaceutical production; theory; applications; mechanisms of localization, radionuclide and radiopharmaceutical drug applications and related regulatory aspects. Offered in alternate years. (S/U grading only.)

461. Clinical Clerkship in Diagnostic Radiology (1-18) I, II, III, IV. Greenspan

Clinical activity—full time (3 days per unit). Prerequisite: completion of third year of Medical School; consent of instructor. Student works with radiologists at UCD Medical Center in film reading sessions and radiological procedures; includes fluoroscopy, vascular radiology and special investigations. Includes daily individual teaching sessions with faculty radiologists, radiology learning laboratory, and all-radiology conferences and seminars. Limited enrollment.

498. Group Study in Diagnostic Radiology (1-12) I, II, III, IV. The Staff

Prerequisite: consent of instructor. (S/U grading only.)

499. Research in Diagnostic Radiology (1-12) I, II, III, IV. The Staff

Prerequisite: consent of instructor. Approved for graduate degree credit. (S/U grading only for medical students.)

Radiology—Nuclear Medicine (RNU)**Upper Division Courses**

101. Biomedical Radiochemistry (3) III. The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Course is designed to combine basic nuclear physics, chemistry, and biology into a comprehensive and vigorous lecture-laboratory experience in biomedical nuclear chemistry. Subjects include choice and purification of appropriate gamma and beta radioisotopes, compounding biological pharmacodynamics and radioimmunoassay. (Same course as 401.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (S. DeNardo in charge)

Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Stadlnik in charge)

Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

Graduate Course

299. Research: Special Study for Graduate Students (1-12) I, II, III, IV. The Staff (Director in charge)
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Professional Courses

401. Biomedical Radiochemistry (3) III. The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: open to graduate and medical students; consent of instructor. Approved for graduate degree credit. Course is designed to combine basic nuclear physics, chemistry, and biology into a comprehensive and vigorous lecture-laboratory experience in biomedical nuclear chemistry. Subjects include choice and purification of appropriate gamma and beta radioisotopes, compounding biological pharmacodynamics and radioimmunoassay. (Same course as 101.)

411. Radiological Physics I (Physics of Nuclear Medicine) (5) I. Bushberg, Vera

Lecture—43 hours total; laboratory—12 hours total. Prerequisite: consent of instructor. Physics of diagnostic and therapeutic nuclear medicine, nuclear physics, radioactive decay; interaction of ionizing radiation; dosimeters; attenuation; internal and external dosimetry; health physics; radiation detection and imaging, scintillation cameras, computerized planar and tomographic imaging. Offered at UC Davis Medical Center. Offered in alternate years. (S/U grading only.)

463. Clinical Clerkship in Nuclear Medicine (9 or 18) I, II, III, IV. Stadlnik

Clinical activity—full time (3 days per unit). Prerequisite: satisfactory completion of second year of Medical School or the equivalent; consent of instructor. Clerkship correlates radioisotopic methods with clinical, pathophysiologic, and other diagnostic aspects of the patient's care. Each patient reviewed with student by faculty member. Reading assignments, informal projects, and research techniques available. Limited enrollment with preference to students enrolling for 18 units.

498. Group Study in Nuclear Medicine (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Approved for graduate degree credit. (S/U grading only for medical students.)

499. Research in Nuclear Medicine (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Approved for graduate degree credit. (S/U grading only for medical students.)

Surgery (SUR)**Upper Division Courses****192. Internship in General Surgery** (1-12) I, II, III, IV. The Staff

Internship—3-36 hours. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in general surgery and related fields. (P/NP grading only.)

199. Special Study in General Surgery for Advanced Undergraduates (1-5) I, II, III, IV. The Staff

Prerequisite: advanced undergraduate student with consent of instructor. (P/NP grading only.)

Graduate Course

299. Research (1-12) I, II, III, IV. Wolfe in charge
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Professional Courses**419. Introduction to Clinical Surgery** (1-6) I, II, III, IV. Ward

Clinical activity—full time. Prerequisite: second-year medical student with consent of instructor. Designed to introduce medical students to basic principles of surgical practice and the most common surgical diseases. Course will afford opportunity to review surgical patients and discuss them with members of staff.

460. Clinical Surgical Elective (6-18) I, II, III, IV. Benfield

Clinical activity—full time. Prerequisite: fourth-year medical student or third-year medical student with completion of Medical Sciences 430. Rotation through Surgery Specialty clinics: vascular, GI, GU, thoracic, plastic, radiotherapy. Student works up one new, two return patients. Presents consult to on-site faculty. Weekly review with preceptor and course director. Reading assignments to add perspective for in-depth discussion.

461. Surgery Burn Unit Clerkship (6 or 9) I, II, III, IV. The Staff

Clinical activity—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student functions as an extern in the eight-bed Burn Unit; learns principles of critical care, fluid and electrolyte resuscitation and management of surgical wounds.

462. Surgery Trauma Service Clerkship (6 or 9) I, II, III, IV. Blaisdell and staff

Clinical activity—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student works as an extern on one of the two general surgery Trauma teams, participating in resuscitation and management of critically injured patients. Team hours consist of 24 hours on, and 24 hours off.

463. Surgery Intensive Care Unit (6 or 9) I, II, III, IV. Holcroft and staff

Clinical activity—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student participates in direct supervision of critically ill surgical patients in a twelve-bed surgery ICU. Each student is closely supervised. Provides in-depth experience with management of critically ill patients.

464. General Surgery Clerkship: Kaiser Hospital (6 or 9) I, II, III, IV. The Staff

Clinical activity—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student participates with University residents on the teaching services at Kaiser Hospital, Sacramento. Opportunity to see larger number of practical, general surgical problems and participate in their care.

466. General Surgery Clerkship: Travis AF Base Hospital (6 or 9) I, II, III, IV. Kline, Holcroft

Clinical activity—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Opportunity to participate on the surgical service of our affiliated Air Force Hospital. The program has a large number of general surgery problems and provides a broad clinical experience in surgery.

467. Surgical Oncology (3-9) I, II, III, IV. Goodnight and staff

Clinical activity—full time (2 to 6 weeks). Prerequisite: fourth-year medical student or third-year medical student with completion of Medical Sciences 430. Student learns medical and surgical principles applicable to cancer. Participation in the care and major surgical oncologic problems; and opportunity to learn the medical, radiologic, and surgical approaches to cancer therapy.

468. Cardiothoracic Surgery Clerkship (6-9) I, II, III, IV. Benfield

Variable clinical activity—full time (4 to 6 weeks). Prerequisite: fourth-year medical student or third-year medical student with completion of Medical Sciences 430. Student works as an extern on the Cardiothoracic Surgical Service, participating in perioperative management and operations on the heart, lungs, mediastinum, and other thoracic structures. Regularly scheduled teaching conferences are conducted.

478. Surgical Preceptorship: Off Campus (6-18) I, II, III, IV. Holcroft

Clinical activity—full time. Prerequisite: fourth-year medical student and consent of instructor. Student participates in the preoperative, operative and post-operative care of surgical patients under the supervision of attending staff.

480. Insights in Surgery (1-3) I, II, III, IV. The Staff

Clinical activity—3 to 9 hours. Prerequisite: medical student in good academic standing and consent of instructor. Individualized activities, including ward rounds, subspecialty clinics and conferences, grand rounds, and observation of a variety of surgical procedures. (S/U grading only.)

494H. Fourth-Year Surgical Honors Program (18) I, II, III, IV. Holcroft

Prerequisite: completion of third year of Medical School with superior performance on Medical Sciences 430; consent of instructor. To provide intensive and comprehensive training in surgery to students interested in postgraduate surgical career, that would enable them to succeed during the internship and residency training. (S/U grading only.)

498. Group Study (1-5) I, II, III, IV.

Prerequisite: medical student; consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics. (S/U grading only.)

499. Laboratory Research (1-12) I, II, III, IV. Holcroft and staff

Laboratory—3-36 hours. Prerequisite: completion of second year of medical school; consent of instructor. Laboratory research on surgically related problems. Participation in projects to include the following: burn, nutrition, oncology, transplant and others. (S/U grading only.)

Urology (URO)**Upper Division Course****199. Special Study for Advanced Undergraduates** (1-5) I, II, III, IV. deVere White

Prerequisite: consent of instructor. (P/NP grading only.)

Professional Courses**400. Office Urology** (1) I, II, III, IV. deVere White

Clinical activity—4 hours in afternoons (6 weeks). Prerequisite: fourth-year medical students with consent of instructor. Introduction to ambulatory care of urologic patients including basic therapeutic and diagnostic procedures from case material referred to private clinic. Management of urinary tract infection will be emphasized.

460. Urology Clinical Clerkship (5-18) IV, I, II, III. deVere White

Clinical activity—full time. Prerequisite: second-year medical student; physical diagnosis or the equivalent; consent of instructor. Clinical experience in diagnosis and treatment of urologic disease. Student will work closely with house staff, participate in conferences and surgery, and perform initial patient evaluation on new patients. May be repeated for credit. Limited enrollment.

461. Externship in Urology (5-18) I, II, III, IV. deVere White

Clinical activity—full time. Prerequisite: fourth-year medical students with consent of instructor. Under supervision, student acting as intern will assume full inpatient responsibility including admission history, physical examination, management of hospitalization, and participate in surgical procedures, outpatient clinic and learning diagnostic and therapeutic procedures. May be repeated for credit.

499. Research in Urology (1-12) I, II, III, IV. deVere White

Research—3-36 hours. Prerequisite: medical or veterinary medical students with consent of instructor. Research in oncology, male infertility, urodynamics, neurogenic bladder. Unique opportunity to apply recent technologies (nuclear medicine resonance, flow cytometry, recombinant DNA) in investigation, diagnosis and treatment of GU cancer, infectious disease, male infertility and development of genitourinary bioprosthesis.

Medicine and Epidemiology

(School of Veterinary Medicine)

Anthony A. Stannard, D.V.M., Ph.D., Chairperson of the Department

Department Office, 2102 Medical Science 1A
(916-752-1363)

Faculty

Alexander A. Ardans, D.V.M., M.S., Professor (*Medicine and Epidemiology, Pathology, Microbiology and Immunology*)

Dale L. Brooks, D.V.M., Ph.D., Lecturer

Gary P. Carlson, D.V.M., Ph.D., Professor

Tim Carpenter, Ph.D., Professor

Jim Case, D.V.M., Ph.D., Associate Professor

Larry D. Cowgill, D.V.M., Ph.D., Associate Professor

Nancy E. East, M.S., D.V.M., M.P.V.M., Associate Professor

Pamela H. Eisele, D.V.M., Assistant Clinical Professor

Laurence R. Enos, Pharm.D., Lecturer

Edward Feldman, D.V.M., Professor

Ian Gardner, D.V.M., M.P.V.M., Ph.D., Assistant Professor

Lisle W. George, D.V.M., Ph.D., Associate Professor

Ronald P. Hedrick, Ph.D., Associate Professor

David E. Hinton, Ph.D., Professor

David Hird, D.V.M., M.P.V.M., Ph.D., Professor

Peter J. Ihrke, V.M.D., Professor

Mark D. Kittleson, D.V.M., M.S., Ph.D., Professor
Gerald V. Ling, D.V.M., Professor

John P. Maas, D.V.M., M.S., Assistant Professor of
Clinical Diagnostic Medicine Vet/Ext

John Madigan, M.S., D.V.M., Associate Professor

Richard W. Nelson, D.V.M., Associate Professor

Ben Norman, D.V.M., M.S., Ph.D., Lecturer

Niels C. Pedersen, D.V.M., Ph.D., Professor

Lyndsay G. Phillips, D.V.M., Associate Professor

Jeffrey A. Roberts, D.V.M., Assistant Clinical Professor

Bradford P. Smith, D.V.M., Professor

Ellen Sparger, D.V.M., Ph.D., Adjunct Professor

Sharon J. Spier, D.V.M., Ph.D., Assistant Professor

Anthony A. Stannard, D.V.M., Ph.D., Professor (*Medicine, Pathology*)

Carolyn Stull, Ph.D., Extension Specialist

William P. Thomas, D.V.M., Associate Professor

Mark Thurmond, D.V.M., M.P.V.M., Ph.D., Professor

Michael Torten, D.V.M., Ph.D., Research Virologist

James F. Wilson, D.V.M., J.D., Lecturer

W. David Wilson, B.V.M.S., M.R.C.V.S., Associate Professor

Emeriti Faculty

Murray E. Fowler, D.V.M., Professor Emeritus

Donald G. Low, D.V.M., Ph.D., Professor Emeritus

William R. Pritchard, D.V.M., Ph.D., J.D., Professor Emeritus

Livio G. Raggi, D.V.M., Ph.D., Professor Emeritus

Edward A. Rhode, D.V.M., Professor Emeritus

Donald R. Strombeck, D.V.M., Ph.D., Professor Emeritus

Courses in Medicine and Epidemiology (VME)**Upper Division Course****199. Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses**217. Evaluation of Diagnostic Tests** (2) III. Gardner

Lecture/discussion—1.7 hours; laboratory—1 hour. Prerequisite: consent of instructor. Topics include sensitivity, specificity, predictive values, Bayes' Theorem, ROC curves, measuring agreement between tests, series and parallel testing strategies. Emphasis on rational interpretation and presentation of test results for individuals and aggregates. Offered in alternate years.

255. Animal Health Economics (3) III. Carpenter
Lecture—3 hours. Prerequisite: consent of instructor. Basic concepts of microeconomics (production and cost functions, firm decision making, and the market place) as they relate to animal health are considered. Application of economic decision making techniques which may be used in veterinary medicine are also presented.

290. Seminar in Veterinary Medicine (1) I, II, III. The Staff (Chairperson in charge)

291. Seminars in Epidemiology (1) III. Seminar—1 hour. Participants will present and discuss ongoing or published research projects in epidemiology. Emphasis will be on study design and data analysis. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
Prerequisite: student in School of Veterinary Medicine or consent of instructor. Group study in selected areas of the clinical sciences. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses**401. Small Animal Clinics** (1 1/2 per week) I, II, III. The Staff (Ling in charge)

Laboratory—50 hours total. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Resident responsible for diagnoses, medical and surgical treatment of animals in the wards and outpatient clinic, including history taking, physical examinations, laboratory tests,

special diagnostic and therapeutic procedures, and consultations, under the direction of the senior staff. May be repeated for credit. (S/U grading only.)

402. Large Animal Medicine (1 1/2 per week) I, II, III. The Staff (Smith in charge)

Laboratory—50 hours total. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents responsible for the medical care of patients in the VM Teaching Hospital and outpatient clinics under the direction of the senior staff of the hospital. May be repeated for credit. (S/U grading only.)

403. Small Animal Medicine (1 1/2 per week) I, II, III. The Staff (Ling in charge)

Laboratory—50 hours total. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents responsible for the medical care of animals in the wards and outpatient clinic including physical examinations, history taking, laboratory tests, and consultations under the supervision of the senior staff. May be repeated for credit. (S/U grading only.)

410. Management of Captive Wild Animals (2) II. Brooks

Lecture—2 hours. Prerequisite: second-year standing in the School of Veterinary Medicine. Introduction to management and husbandry dynamics as a prerequisite for preventive health programs in zoos, aquaria, vivaria, and other environments for exotic pets and wild animals.

411. Laboratory Animal Medicine (2) II. Brooks

Lecture—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Diagnostic, therapeutic and preventive methods for diseases of rabbits, guinea pigs, hamsters and certain related laboratory rodents will be presented to serve the needs of clinical and research veterinarians. Lecture demonstrations with subject species will be provided.

412. Laboratory Animal Medicine (2) III. Brooks

Lecture—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Prevention, diagnosis and therapy of medical problems in rabbits, guinea pigs, hamsters, mice, rats and other laboratory species. Emphasis will be placed on animal colony health management technique, and concepts of preventive disease needed by veterinarians in charge of research facilities.

413. Medical Primatology (2) III. Roberts

Lecture—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Major diseases, medical management and husbandry of captive nonhuman primates. (S/U grading only.)

414. Applications of Epidemiologic Methods to Herd Health (3) III. Gardner

Lecture/discussion—2 hours; fieldwork—2 hours. Prerequisite: Epidemiology and Preventive Medicine 405 and 406 or consent of instructor. Epidemiologic applications to health and production problems in animal populations, topics include test interpretation, decision-tree analysis, time trend analysis, disease reporting, investigation of chronic diseases, microcomputer programs for herd health will be discussed.

415. Management and Diseases of Captive Wildlife (2) II. Phillips

Lecture—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Lectures, demonstrations, and discussions used to illustrate selected medical problems of captive wild animals.

416. Aquatic Animal Medicine (2) III. Hedrick

Lecture—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Etiology, pathology, diagnosis, treatment and prevention of diseases of fish and of some aquatic arthropods and mammals. Preventive management of diseases in aquaculture.

417. Cage Bird Medicine (2) II. Phillips

Lecture—20 hours. Prerequisite: third-year veterinary medical student or consent of instructor. Approved for graduate degree credit. Medical and surgical problems of caged birds; handling and restraint, feeding,

nutritional and infectious diseases, anesthesia and surgery, plus problems of organ systems.

421. Veterinary Dermatology (3/4 per week) I, II, III. Stannard

Laboratory—25 hours. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents are responsible for patient care in the hospital and outpatient clinic including history taking, physical examinations, and diagnostic procedures under the direction of the staff dermatologist. (S/U grading only.)

***423. Pulmonary Diseases** (3/4 per week) I, II, III.

Laboratory—25 hours. Prerequisite: professional standing intern in Veterinary Medical Teaching Hospital, or consent of instructor. New and advanced techniques for the detection and characterization of respiratory and cardiac diseases in animals demonstrated and discussed. Interns assist in assessment of respiratory dysfunction of patients and correlation of the dysfunction and clinical signs. (S/U grading only.)

425. Zoo and Wildlife Medicine (3/4 per week) I, II, III. Phillips

Laboratory—25 hours. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents responsible for assisting in handling and treatment of clinic cases and for learning the techniques of manual and chemical restraint of a wide variety of mammals, birds, reptiles, and fish. Medication problems, anesthetic techniques, and surgical procedures will be discussed and practiced. (S/U grading only.)

428. Food Animal Surgery (1.6) III. Smith

Lecture—16 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Selected topics in surgical diseases of food animals covered in detail. (S/U grading only.)

428L. Food Animal Surgery Laboratory (0.7) III. Smith

Laboratory—7 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine; course 428 (concurrently). Representative surgeries of food animals performed by groups of students. Limited enrollment. (S/U grading only.)

430A-430B-430C. Raptor Medicine (1-1-1) I-II-III. Brooks

Lecture—1 hour. Prerequisite: upper division standing (Avian Science 115 recommended) or second-year standing in the School of Veterinary Medicine. Three-part course sequence offered sequentially with laboratory course 431A-431B-431C, providing birds of prey medical and rehabilitation techniques and skills. Fall—normal raptor; winter—abnormal raptor; spring—rehabilitation.

431A-431B-431C. Raptor Medicine Laboratory (1-1-1) I-II-III. Brooks

Laboratory—3 hours. Prerequisite: upper division standing (Avian Science 115 recommended) or second-year standing in the School of Veterinary Medicine; and course 430A-430B-430C concurrently. Three-part course sequence offered sequentially with lecture course 430A-430B-430C, providing birds of prey medical and rehabilitation techniques and skills. Fall—normal raptor; winter—abnormal raptor; spring—rehabilitation.

432A-413B-413C. Raptor Clinics (1-1-1) I-II-III. Brooks

Laboratory—3 hours. Prerequisite: student in the School of Veterinary Medicine or consent of instructor. Serves as student treatment crew for the Raptor Center, providing hands-on experience with handling, restraint and treatment for ill and injured birds of prey with the goal of rehabilitation and release back into their native habitat. (S/U grading only.)

446. Small Animal Reproduction (1) III. Feldman

Lecture—7 hours; discussion—1 hour; laboratory—2 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Provides a complete description (history, physical examination, laboratory abnormalities, etc.) of the common abnormalities associated with the genital tract of male and female dogs and cats.

448A. Small Animal Medicine—Level 1 (6.0) I. Nelson

Lecture—5 hours (for 12 weeks). Prerequisite: course 447. Fundamental principles, clinical manifestations, diagnostic methods and therapeutic approaches to the medical diseases of the dog and cat. Courses is a core option for the professional veterinary curriculum and preparatory for advanced courses in small animal medical diagnosis and therapeutics.

448B. Small Animal Medicine—Level II (5.4) II. Ihrke

Lecture—37 hours; laboratory 13 hours; discussion—4 hours. Prerequisite: course 447 and 448A. Fundamental principles, clinical manifestations, diagnostic methods and therapeutic approaches to the medical diseases of the dog and cat. Course is a core option for the professional veterinary curriculum and preparatory for small animal medical diagnosis and therapeutics.

449A. Large Animal Medicine—Level 1 (6.1) I. Wilson and staff

Lecture—5 hours (for 12 weeks); laboratory—3 hours (for 2 weeks). Prerequisite: course 447. Instruction in the etiology, pathophysiology, epidemiology, clinical presentation, diagnostic evaluation, treatment, prevention, and control of important infectious and non-infectious diseases of Food Animals and horses. A problem-based approach to differential diagnosis will be emphasized.

449B. Level II Advanced Equine Medicine (4.9) II. Madigan

Lecture—49 hours total. Prerequisite: course 449A. Instruction in the medical aspects of equine practice including large and small farm management practices, sports medicine principles and applications, perinatology and neonatology and the etiology, epidemiology and control of various infectious and non-infectious conditions of the equine.

449L. Level II Advanced Equine Medicine Laboratory (0.6) II. Madigan

Laboratory—6 sessions. Prerequisite: course 449A, course 449B concurrently. Clinical presentation and instruction in treatment of the medical aspects of equine practice. (S/U grading only.)

450. Clinical Immunology (2.2) III. Pedersen

Lecture—16 hours; laboratory—6 sessions. Prerequisite: basic immunology, second-year standing in the School of Veterinary Medicine. Comprehensive discussion of the basic mechanisms of immunologic diseases in small companion animals and a description of common immunologic diseases, including clinical presentation, diagnosis and treatment.

457. Veterinary Business Management (2) II. Wilson

Lecture—10 two-hour sessions. Prerequisite: third- or fourth-year standing in School of Veterinary Medicine or consent of instructor. Course presents a groundwork of information which is essential to the successful management of a veterinary practice. Topics to be covered include basic accounting, medical recordkeeping, money management, business and personal insurance, client relations and tax law. (S/U grading only.)

464. Therapeutic and Restraint Procedures of Food Animals (0.5) II. George

Laboratory—two 3-hour sessions; lecture—1 session. Prerequisite: course 447. Introduction to animal restraint and therapeutic techniques. (S/U grading only.)

481A-481B-481C. Clinic Rounds (1-1-1) I-II-III. Ling, Smith

Discussion—1 hour. Prerequisite: first or second year standing in the School of Veterinary Medicine. Discussion of selected small and large animal cases from the Veterinary Medicine Teaching Hospital. (S/U grading only.)

486A. Equine Clinical Neonatology (1) II. Madigan

Discussion—1 hour. Prerequisite: first-year standing in the School of Veterinary Medicine or consent of instructor. Discussion of methods of equine neonatal intensive care and disease pathophysiology in a case format. (S/U grading only.)

486B. Equine Clinical Neonatology (1) III. Madigan Discussion—1 hour. Prerequisite: first year standing in the School of Veterinary Medicine or consent of instructor. Discussion of methods of equine neonatal intensive care and disease pathophysiology in a case format. (S/U grading only.)

487. Comparative Bio-Medical: Form and Function (2) III. Roberts
Lecture—1 hour; discussion—2 hours. Prerequisite: first or second year standing in the School of Veterinary Medicine or consent of instructor. Introduction and basic prerequisite for Zoological Medicine courses, involving comparative biology recommended concepts for nontraditional animal species or alternative pets, zoos, rehabilitation centers, aquaculture, laboratory animals, and non-human primates.

488. Nondomestic Pet Animal Medicine (2) III. Brooks
Discussion—2 hours. Prerequisite: second-year standing in the School of Veterinary Medicine. Discussion of practical medical and surgical management of common spontaneous and infectious diseases of nondomestic pets.

489. Personal, Financial, and Professional Development (1) II. Wilson
Lecture—1 hour. Prerequisite: third-year standing in the School of Veterinary Medicine. Focus on skills essential for successful careers in veterinary medicine. Includes personal finance and investment strategies; understanding personal taxation; bookkeeping and accounting; insurance needs; and stress management. (S/U grading only.)

491. Small Animal Grand Rounds (1/2) I, II, III. The Staff (Ling in charge)
Discussion—1 hour. Prerequisite: professional standing, intern, or resident in Veterinary Medical Teaching Hospital or consent of instructor. Residents take an active part in the presentation and discussion of selected cases from the small animal clinic. May be repeated for credit. (S/U grading only.)

492. Large Animal Grand Rounds (1/2) I, II, III. The Staff (Carlson in charge)
Discussion—1 hour. Prerequisite: professional standing as resident in Veterinary Medical Teaching Hospital or consent of instructor. Residents take an active part in the presentation and discussion of selected cases from the large animal and ambulatory clinics. May be repeated for credit. (S/U grading only.)

493. Seminar in Veterinary Medicine (1) I, II, III. The Staff (Cowgill and Smith in charge)
Seminar—2 hours. Prerequisite: professional standing; resident in Veterinary Medical Teaching Hospital. Seminars given by the faculty of the School of Veterinary Medicine in topics relating directly to the practice of clinical medicine and surgery. Residents will assist in the presentation of seminar material. May be repeated for credit. (S/U grading only.)

beginnings of the Renaissance. The program involves studies in history, art, philosophy, literature, drama, music, national languages, religion, rhetoric, and political theory.

The Program. The major is designed to give students a broad view of the period and to allow for the flexibility necessary to accommodate their individual interests. The department offers a series of medieval studies courses providing an excellent introduction to the major, and preparation for advanced work within the individual disciplines. On the upper division level, each student completes course work in specific areas of history (the fall of Rome to the Renaissance), literature (Old and Middle English, Chaucer, romantic literature, including French, German, Italian, Russian, Latin), philosophy and religion, arts and language, and political thought. In addition, each student may complete a senior thesis on some selected aspect of medieval culture.

Career Alternatives. The major in medieval studies is a liberal arts degree providing excellent preparation for the rigors of the professional schools as well as careers in law, library science, museology, journalism, and teaching.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter
Recommended: Art 1B, History 4A, Philosophy 21, Medieval Studies 20A, 20B, 20C, Religious Studies 10.
Language proficiency is a necessity; courses in Latin and other European languages are strongly recommended, particularly for students planning to pursue graduate studies in the medieval field.

Depth Subject Matter52
History, at least 12 units from History 102B, 121A, 121B, 121C, 201B12
Literature: at least 16 units, including two courses from each of two of the following16
(a) English 111, 113A, 113B, 150A, 188, 189.
(b) French 115, 141.
(c) German 120, 122.
(d) Italian 113, 115A, 115B, 139B, 140.
(e) Latin 101, 102, 103, 104, 105, 106, 108, 109, 111A, 111B, 111C, 112, 114, 115, 116.
Philosophy and religion, at least 8 units from Philosophy 105, 132, 145, 146, 190; Religious Studies 102, 1108
Arts and language, at least 8 units from Art 176A, 176B, 176C, 177A, 178A, 178B; Dramatic Art 156, German 106; Music 121 (note prerequisite), 199; Rhetoric and Communication 110, 1118
Political thought, at least one course from Political Science 115, 116, 118A4
Senior thesis, Medieval Studies 1904
Total Units for the Major52

Major Advisers. W. McConnell (*German*), P. Jestic (*History*), K. Roddy (*Medieval Studies*).

Minor Program Requirements:

UNITS

Medieval Studies24
The minor in Medieval Studies is designed to be a coherent program of interdisciplinary study. Medieval Studies units may be taken in one or more of the traditional fields of concentration, including art, drama, history, literature, music, national languages, philosophy, political theory, religious studies and rhetoric. Courses must be upper division and chosen from at least two of these subject areas, and they must be within the three periods of Early Medieval Culture, culture of the High Middle Ages, and Medieval transformations. Students may also select a minor with a thematic emphasis.

There is no foreign language requirement for the minor, although knowledge of Latin or a romance language is recommended.

The minor must be designed in consultation with a Department Adviser.

Minor Advisers. D.J. Dutschke (*Italian*), W. McConnell (*German*), M. Osborn (*English*), Kevin Roddy (*Medieval Studies*).

Courses in Medieval Studies (MST)

Lower Division Courses

20A. Early Medieval Culture (4) I. Roddy
Lecture—3 hours; discussion—1 hour. Readings (in translation) in early medieval culture, such as the Codes of Justinian, the *Confessions* of Saint Augustine, *The Consolation of Philosophy* of Boethius, *Beowulf*, the *Nibelungenlied*, and the *Song of Roland*. General Education credit: Civilization and Culture.

20B. The Culture of the High Middle Ages (4) II. Roddy
Lecture—3 hours; discussion—1 hour. Readings (in translation) in the culture of the high Middle Ages, such as the *Summa Theologica* of Thomas Aquinas, the *Chronicles* of Froissart, *The Canterbury Tales* of Chaucer, and the *Divine Comedy* of Dante. General Education credit: Civilization and Culture.

20C. Medieval Transformations (4) III. Roddy
Lecture—2 hours; discussion—1 hour; paper or formal presentation. Course deals with the great medieval transformations that took place before the Renaissance. Topics will be selected from various disciplines, such as literature, philosophy, religion, history, art, music, political thought, rhetoric, and other pertinent fields. General Education credit: Civilization and Culture.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Upper Division Courses

120A-F. The Medieval World (4) I, II, III. The Staff (Chairperson in charge)
Lecture—2 hours; discussion—1 hour; term paper. Course deals with selected themes from the Middle Ages: the Fall of Rome to the beginning of the Renaissance. Subjects will vary from year to year and cover such topics as

- ***(A)** The Monastic Orders;
- ***(B)** Origins of Universities;
- ***(C)** The Seven Liberal Arts, and their Significance in the Middle Ages;
- ***(D)** Family and Society;
- ***(E)** Chivalry; and
- ***(F)** Church and State.

General Education credit for course 120A or 120D or 120E: Civilization and Culture.

190. Senior Thesis (4) I, II, III. The Staff
Seminar—4 hours. Prerequisite: senior standing and major in Medieval Studies. Preparation of a research paper dealing with a selected aspect of medieval culture, under supervision of three members of the Committee in Charge.

197T. Tutoring in Medieval Studies (1-4) II, III. The Staff (Chairperson in charge)
Seminar—2 hours. Prerequisite: courses 20A and 20B; upper division standing; consent of instructor and chairperson of curriculum committee. Tutoring in Medieval Studies 20A and 20B, including leadership in small discussion groups affiliated with the course. May be repeated for credit for a total of 6 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Medieval Studies

(College of Letters and Science)
_____, Program Director
Program Office, 922 Sproul Hall (916-752-1219)

Committee in Charge

- Samuel G. Armistead, Ph.D. (*Spanish*)
- Dennis Dutschke, Ph.D.
- Ingeborg Henderson, Ph.D. (*German*)
- Phyllis Jestic, Ph.D. (*History*)
- Winder McConnell, Ph.D. (*German*)
- Marijane Osborn, Ph.D. (*English*)
- Larry Peterman, Ph.D. (*Political Science*)
- Kevin Roddy, Ph.D. (*Medieval Studies*)
- George VanDen Abbeele, Ph.D. (*French*)

The Major Program

The major in medieval studies is designed to introduce students to the main features of European civilization during the period from the fall of Rome to the

*Course not offered this academic year.

Mexican-American (Chicano) Studies

See Chicana/Chicano Studies

Microbiology

See Biological Sciences: Section of Microbiology; Microbiology (A Graduate Group); Medical Microbiology (Medicine, School of); and Pathology, Microbiology and Immunology (Veterinary Medicine)

Microbiology (A Graduate Group)

Douglas C. Nelson, Ph.D., Chairperson of the Group
Group Office, 156 Hutchison Hall (Microbiology Section), (916-752-0262)

Faculty. Participating faculty are in the Colleges of Letters and Science and Agricultural and Environmental Sciences, and the Schools of Veterinary Medicine and Medicine.

Graduate Study. The Graduate Group in Microbiology offers study and research leading to the M.S. and Ph.D. degrees. The group offers study in general microbiology, microbial physiology, microbial genetics, molecular mechanisms of microbial regulation, molecular mechanisms of microbial pathogenesis, immunology, virology, and recombinant DNA technology. For information on the graduate study and undergraduate preparation for the program contact a graduate adviser or the Chairperson of the group.

Graduate Advisers. S. Dandekar (*Infectious and Immunologic Diseases*), R.B. Lefebvre (*Pathology, Microbiology and Immunology*), D.M. Ogrydziak (*Food Science and Technology*), M.L. Privalsky (*Microbiology*), E.O. Shuster (*Food Science and Technology*).

Courses in Microbiology (MIB)

Graduate Courses

290C. Advanced Research Conference (1) I, II, III. The Staff (Nelson in charge)
Discussion-conference—1 hour. Prerequisite: graduate standing and/or consent of instructor. Presentation and critical discussion of staff research activities. Designed for advanced graduate students. May be repeated for credit. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
Research under the guidance of dissertation committee. (S/U grading only.)

Military Science

(College of Letters and Science)

Reserve Officers' Training Corps (ROTC), Army

Michael P. Tucker, Lt.Col., Chairperson of the Department

Department Office, 125 Hickey Gymnasium
(916-752-0541)

Faculty

Lieutenant Colonel Michael P. Tucker, Professor
Major Steve Sargent
Captain Gary Thomson
Captain Alan Villandre

Program of Study

The Military Science Department offers hands-on training in management and leadership. The program stresses the following leadership dimensions: oral and written communications, oral presentations (formal briefings), initiative, sensitivity, influence, planning and organizing, delegation, administrative control, problem analysis, judgement, decisiveness, physical stamina, mission accomplishment, and followership. Also stressed are current events, national and international politics, military affairs, ethics training, and human relations with emphasis on eliminating racial and gender discrimination. Management and leadership are taught using the U.S. Army as a model. Military skills (such as drill and ceremonies, map reading, and squad tactics) are taught to the extent necessary to create an environment where students can enter leadership positions and apply theories taught in the classroom. Students learn by doing. The program assists students in all academic fields to prepare for positions of leadership in military or civilian careers.

The department offers two program tracks: (1) a purely academic track, and (2) a precommissioning track for those desiring a commission in the U.S. Army. The academic track entails no obligation to the military and is open to all students. Students pursuing the academic track do not wear a uniform or otherwise participate in extra-curricular activities designed as part of the precommissioning process. Activities for all students include the Ranger Club (a club designed for adventure activities such as rappelling, white-water rafting, paint gun wars, and patrolling) and intramural sports teams.

Students who desire a commission in the U.S. Army participate in both the academic portion of the program and in the leadership laboratories and extra-curricular activities designed to enhance their leadership and technical skills. They wear uniforms to leadership laboratories and selected classes and become ROTC cadets. Students may be cadets in the lower division courses without incurring a military obligation. Students participating in the upper division precommissioning program incur a military obligation. See below for details. Extra-curricular activities for cadets include an intercollegiate sports team (Ranger Challenge), the university color guard, a military honor society, a rifle/pistol team, and opportunities to participate in field training exercises.

Department Programs

Students are enrolled in military science under one of two programs.

Four-Year Program

Students are enrolled in the basic course (lower division) for the first two years on a voluntary basis. **There is no military obligation associated with attendance in lower division courses.** Admission to the advanced course (upper division) is by application from second-year lower division students who meet the academic, physical, and military aptitude requirements. Qualified veterans can enter the advanced course immediately because of their military service

experience, upon approval by the Department Chairperson.

Upper division students receive \$100 subsistence per month after executing a contract agreeing to complete the course and **accept a commission if offered.** During the course all military science text books, uniforms and equipment are provided without cost. Students are given leadership development experience at summer camp (advanced camp) between their third and fourth years of the course. Emphasis is on individual participation, leadership development and the capability to function effectively in positions of significant responsibility.

Two-Year Program

This program is designed for students who have not attended lower division Military Science classes. In lieu of lower division courses an applicant attends a six-week summer camp (basic camp) which is voluntary and carries no military obligation. Applicants are paid for camp attendance and transportation costs. Applications are accepted during the winter and spring terms of the year preceding enrollment in the two-year program. All other provisions explained above for the upper division course apply to the two-year program.

Scholarship Program

The U.S. Army offers four- and three-year Active Duty and two-year Reserve Forces Duty scholarships to students planning to attend or attending UC Davis. The U.S. Army ROTC scholarship pays \$7000 or 80% annually of your college tuition, plus laboratory fees, on-campus education fees, attendance at Advanced Camp, and a flat rate amount from which you may purchase textbooks, classroom supplies and equipment. Scholarship winners also receive a tax-free subsistence allowance of \$100 a month for 10 months for each year that the scholarship is in effect.

The Army Reserve Officers' Training Corps four-year Active Duty merit scholarships are awarded to qualified high school seniors in a national competition each year. There are two cycles available for submission of the four-year scholarship application. High school juniors can compete for an Early Cycles scholarship by submitting their application complete and postmarked by 15 July between their junior and senior years. Applicants will receive notification of their final status by 1 November. As high school seniors, students compete for the Regular Cycle scholarship by submitting their application complete and postmarked by 1 December. Those applicants not selected in the Early Cycle are considered in the Regular Cycle competition. Applicants will receive notification of their final status by 1 March of their senior year in high school. Interested applicants should see their high school counselor for an application or contact UC Davis, Department of Military Science.

The three-year Active Duty and two-year Reserve Forces Duty scholarships are awarded to college students who are already attending UC Davis or transferring from a Junior College to UC Davis, and have three or two years remaining before graduating with a baccalaureate. Students interested in competing for these scholarships can submit their application beginning in November of each school year. The deadline for submission of an application is 15 January for the two-year scholarship and 15 February for the three-year scholarship. Additionally, students may win a two-year scholarship at the six-week summer camp (basic camp) in the Two-Year Program mentioned above. Students apply for these Army scholarships through the Military Science Department.

DASE Cooperative Program

The Department of the Army Scientific and Engineering (DASE) Cooperative Program is designed to support the U.S. Army's efforts to recruit, employ, and retain a science and engineer skilled work force as both military officers and civilian employees.

Qualified students may receive financial assistance of up to \$5,000 per year to pay for tuition, fees, books, lodging, and meals. Additionally, a \$1,000 per year stipend is paid to ROTC Advanced Course students during their last two years in school.

DASE Cooperative students must work in a Department of the Army (DA) Civilian position for a minimum of 26 weeks, typically divided into two thirteen-week periods. At least one work period must be completed during the school year. While working, the DASE student will receive the regular pay and benefits for their grade.

Students must be enrolled full time in an undergraduate program leading to a degree in either science or engineering and enroll, or be enrolled, in the U.S. Army Senior ROTC Program. A first semester freshman applicant needs a high school minimum cumulative grade point average (GPA) of 2.75 on a 4.0 scale and a recommendation from the principal or guidance counselor. Other university applicants must have a 2.0 GPA and a minimum C average in all major fields of study. The DA civilian employers may set their standards above these averages.

Students choose to serve in either the Active Army or a Reserve Forces Component and apply for available DA Civilian positions for a specified period of employment.

For complete information you may contact the Military Science Department or the Planning and Placement Work Learning and Career Center, the Engineering and Physical Science Program Manager.

Leadership Laboratory

During the course of the school year, several week-ends and two hours per week are spent in the conduct of practical exercises. Classes emphasize adventure activities including offense, defense and patrolling techniques, weapons familiarization, rappelling, rope bridging, obstacle courses, leadership reaction course, and land navigation. All cadets are required to attend leadership laboratories for practical leadership experience and to prepare for attendance at the Army ROTC Advanced Camp.

Military Qualifications Standards (MQS) System

During the program of study, students will become familiar with the MQS System. It is designed to articulate skills and knowledge that are required of ROTC commissionees to begin military service. The components of the MQS System include: military skills, professional knowledge, and a professional military education.

The military skills component consists of 73 military skills which are categorized into 12 subject areas. They are basic soldiering tasks fundamental to the military professional and serve as the basis for future branch-directed specialty training.

The 24 professional knowledge subjects familiarize cadets with the history, customs and traditions, leadership and ethics, administration, organization, and training of the U.S. Army.

The professional military education component consists of two essential parts—a baccalaureate degree and at least one undergraduate course from each of five designated fields of study. Cadets must take a course in written communication, military history, human behavior, math reasoning, and computer literacy.

Academic Credit

College of Letters and Science. The Bachelor of Arts degree requires the completion of 180 units. Military Science courses are counted in the allowance for electives.

College of Agricultural and Environmental Sciences. The Bachelor of Science degree in agriculture requires the completion of 180 units. Military Science courses are counted in the unit allowance for electives.

College of Engineering. Military Science units are acceptable toward the requirements for the Bachelor of Science degree to the extent of the unrestricted elective units available in the curriculum being followed.

School of Veterinary Medicine. The number of Military Science units acceptable toward the Bachelor of Science degree in Veterinary Medicine is on an indi-

vidual program basis approved by the Dean of the School. Graduates with the D.V.M. degree may apply for direct commission in the United States Army Veterinary Corps.

Courses in Military Science (MSC)

Lower Division Courses

11. Roles and Organization of the U.S. Army (1) I. Lecture—1 hour. Prerequisite: lower division status. Constitutional and legal basis of the Army, organization and strategic roles in times of war and peace, and "total Army" concept. Impact of civil-military relations and Soviet military power on role of Army studied in context of current problems.

12. Introduction to Military Leadership (2) I. Lecture—2 hours. Prerequisite: lower division standing, and consent of instructor. Introduction to leadership theories used in military organizations. Course surveys the duties and responsibilities of junior Army officers, the general environment in which they work, and leadership roles performed. Introduces military map reading skills.

13. Introduction to Basic Military Operations (1) III. Lecture—1 hour. Prerequisite: lower division status. Basic military tactical theories and their application at the individual and squad level. Course introduces military tactical operations, and covers military first aid. Principles of war as introduced in course 11 are applied to offensive and defensive tactics.

14A. Introduction to Military Leadership Skills (1/2) I. Laboratory—2 hours. Prerequisite: lower division status and consent of instructor; completion of all previous laboratories. Personal and organizational leadership skills introduced in leadership laboratory. Extensive supervised leadership experiences conducted in a military environment. Basic military skills necessary to function in a leadership role are also covered. (P/NP grading only.)

14B. Introduction to Military Leadership Skills (1/2) II. Laboratory—2 hours. Prerequisite: lower division status and consent of instructor; completion of all previous laboratories. Development of leadership and military skills introduced in course 14A is continued with emphasis on the individual's role in the squad, the basic organizational element of the Army. As students gain capabilities, supervisory controls are reduced. (P/NP grading only.)

14C. Introduction to Military Leadership Skills (1/2) III. Laboratory—2 hours. Prerequisite: lower division standing and consent of instructor; completion of all previous laboratories. Students demonstrate skill levels required for promotion to non-commissioned officer level. Use of chain of command from company through individual levels emphasized. Interrelationship of squad and platoon organizations is explored. (P/NP grading only.)

21. Military History (2) III. Lecture—2 hours. Prerequisite: lower division status; course 11 or consent of instructor. Survey of military history from 1900 to present, focusing on World War I, World War II, the Korean War, and the Vietnam War.

22A. Intermediate Military Leadership and Operations: I (2) I. Lecture—2 hours. Prerequisite: lower division status; course 12 or consent of instructor. Develops and exercises personal military leadership skills in extensive supervised leadership laboratories. Intermediate level military skills necessary for leadership roles as junior non-commissioned officers are developed. Students perform in role of junior non-commissioned officers.

22B. Intermediate Military Leadership and Operations: II (2) I. Lecture—2 hours. Prerequisite: lower division status; course 22A or consent of instructor. Continuation of course 22A. Individual leadership traits identified in course 22 are studied in more depth enabling each student to improve on targeted weaknesses. Instruc-

tion is presented in intermediate defensive tactics at the squad level.

24A. Individual Military Leadership Skills (1/2) I. Laboratory—2 hours. Prerequisite: lower division status; courses 14A, 14B, 14C and 21, or consent of instructor. Develops and exercises personal military leadership skills in extensive supervised leadership laboratories. Intermediate level military skills necessary for leadership roles as junior non-commissioned officers are developed. Students perform in role of junior non-commissioned officers. (P/NP grading only.)

24B. Individual Military Leadership Skills (1/2) II. Laboratory—2 hours. Prerequisite: lower division status; courses 14A, 14B, 14C and 21, or consent of instructor. Personal supervisory and leadership styles are developed in a supervised laboratory environment. Students are rotated through squad and team-level supervisory positions, given responsibility concomitant with positions. (P/NP grading only.)

24C. Individual Military Leadership Skills (1/2) III. Laboratory—2 hours. Prerequisite: lower division status; courses 14A, 14B, 14C and 21, or consent of instructor. Students are prepared for transition from junior leader to senior non-commissioned officer. Chain of command and hierarchical responsibilities and reporting requirements are demonstrated in a laboratory setting. (P/NP grading only.)

Upper Division Courses

131. Advanced Military Leadership and Management (2) III. Lecture—2 hours. Prerequisite: upper division status; course 22A or consent of instructor. Course addresses different types of power and influence a military leader may use, reviews counseling techniques, and introduces basic management skills. Instruction provided on the various branches in which a commissioned officer could serve.

132A. Advanced Military Operations (2) I. Lecture—2 hours. Prerequisite: upper division status; course 22B or consent of instructor. First phase of advanced military tactical operations. Advanced work on topographical maps, navigation, and orienteering techniques. Instruction is also provided on resource planning techniques and military intelligence.

132B. Advanced Military Operations (2) II. Lecture—2 hours. Prerequisite: upper division status; course 132A or consent of instructor. Continuation of course 132A. Military tactical theories and their application in offense and defense are presented at the platoon and company level. Course covers in-depth analysis of the principles of war related to offensive and defensive operations.

134A. Military Organizational Leadership Skills (1/2) I. Laboratory—2 hours. Prerequisite: upper division status; courses 24A-24B-24C or consent of instructor. Students develop interpersonal and management skills by practical application of leadership of military organizations in a supervised leadership laboratory. Advanced-level military skills presented. Students fulfill the roles of senior non-commissioned officers. (P/NP grading only.)

134B. Military Organizational Leadership Skills (1/2) II. Laboratory—2 hours. Prerequisite: upper division status; courses 24A-24B-24C or consent of instructor. As more complex material is presented in classroom, the laboratory environment becomes more challenging. Students serve as senior non-commissioned officers in squad, platoon and company levels, given appropriate authority and responsibility. (P/NP grading only.)

134C. Military Organizational Leadership Skills (1/2) III. Laboratory—2 hours. Prerequisite: upper division status; courses 24A-24B-24C or consent of instructor. Students prepared for advanced summer training experience by extensive requirements to plan, organize and conduct military operations in field environments; individual leadership potential is closely assessed in the laboratory environment. (P/NP grading only.)

141. U.S. Army Management Systems (2) III.

Lecture—2 hours. Prerequisite: upper division status and course 131. Army decision making, personnel and equipment management. Includes command and staff functions, training, intelligence gathering, techniques for the conduct of meetings, and logistics management procedures at unit level.

142. Military Law (2) II.

Lecture—2 hours. Prerequisite: upper division status and course 141. Analysis of the American Military Justice System, the Uniform Code of Military Justice, the Hague and Geneva Conventions, and customary law of war. Includes detailed study of selected procedures of military justice system.

143. Military Ethics and Professionalism (2) I.

Lecture—2 hours. Prerequisite: upper division status and course 142. Profession of arms, its characteristics, uniqueness, roles, and responsibilities. Discussion topics include the professional soldier's responsibilities to the Army and the Nation, and the need for ethical conduct. Case studies are used to develop ethical decision making skills.

144A. Military Training Leadership Skills (1/2) I.

Laboratory—2 hours. Prerequisite: upper division status; courses 134A, 134B, 134C, and 141. Develops and exercises the leadership skills necessary to plan, coordinate and conduct a training program through practical application under supervision. Emphasis on analysis of objectives, instructor planning, media utilization and evaluation of learning. Students perform as cadet officers. (P/NP grading only.)

144B. Military Training Leadership Skills (1/2) II.

Laboratory—2 hours. Prerequisite: upper division status; courses 134A, 134B, 134C, and 141. Requirements for training of all other levels of the cadet corps are given to students for conduct in laboratory environment (under supervision). Students placed in realistic role of junior officer with appropriate level of responsibility. Students perform as cadet staff officers. (P/NP grading only.)

144C. Military Training Leadership Skills (1/2) III.

Laboratory—2 hours. Prerequisite: upper division status; courses 134A, 134B, 134C, 141. Final laboratory in military science sequence; students are prepared for final testing and certification prior to commissioning as officers. Students will demonstrate all leadership skills necessary to commissioned officers. Students perform leadership tasks at platoon, company, and battalion levels. (P/NP grading only.)

191. Special Studies in Military Science (2) Tucker Independent study—6 hours. Prerequisite: consent of department chair, and courses 131, 132A, 132B, 141, 142, 143. Intensive examination of one or more special problems in military science. Possible areas of study include leadership dimensions, principles of war, air-land battle imperatives, military strategy, the operational art and professional ethics. May be repeated twice for credit when different topic is studied. (P/NP grading only.)

Aerospace Studies (Air Force)

Air Force ROTC is available to UC Davis students through a program offered at California State University, Sacramento (CSUS). UC Davis' participation is large, with about 30 percent of the corps commuting to CSUS from UC Davis. The CSUS Department of Aerospace Studies (AFROTC) offers a one-, two-, or four-year programs leading to a commission in the United States Air Force. All course work (12 or 16 semester units) is completed on the CSUS campus. Drills and courses are normally offered on Thursday mornings. Field Training is conducted during part of the summer at an active Air Force base between the student's sophomore and junior years. Upon completion of the program (integrated with UCD's quarter system) and all requirements for the Bachelor's degree, cadets are commissioned second lieutenants in the Air Force and serve a minimum of four years on active duty. Graduates who are qualified and selected may enter pilot or navigator training after graduation, or serve in a specialty consistent with their academic major, individual goals, and existing Air Force needs. Graduates may request a delay of entry on active duty

to continue their education or may apply for Air Force sponsored graduate study to begin immediately upon entry on active duty. Due to firm scheduling requirements for the AFROTC program, students are encouraged to work closely with their academic advisers in planning this academic program.

Application to the AFROTC program should normally be no later than the middle of a student's sophomore year. Upper classmen and graduate students may also apply under special conditions. Contact representatives in the Aerospace Studies Department at CSUS, telephone (916) 278-7315, for information on the program or processing of entry. (An AFROTC program is also available within the UC system at Berkeley campus, Department of Aerospace Studies, (800) 852-5747.)

AFROTC offers 3-year and 2-year scholarships to qualified students. Applications are accepted in a variety of academic disciplines; however, particular emphasis will be given to applicants in the fields of engineering, meteorology, and nursing.

Molecular Biosciences

(School of Veterinary Medicine)

Shri N. Giri, B.V.Sc., Ph.D., Chairperson of the Department

Department Office, 1311 Haring Hall (916-752-1059)

Faculty

Alan R. Buckpitt, Ph.D., Professor
 Francis D. Galey, D.V.M., Ph.D., Assistant Professor
(Molecular Biosciences, California Veterinary Diagnostic Laboratory)
 Shri N. Giri, B.V.Sc., Ph.D., Professor
 Robert J. Hansen, Ph.D., Professor
 Arthur D. Jones, Ph.D., Assistant Adjunct Professor
 Robert M. Joy, Ph.D., Professor
 James B. Knaak, Ph.D., Assistant Adjunct Professor
 James G. Morris, Ph.D., Professor
 Michael E. Mount, D.V.M., Ph.D., Associate Professor
 Isaac N. Pessah, Ph.D., Associate Professor
 Otto G. Raabe, Ph.D., Professor in Residence
(Molecular Biosciences, Civil and Environmental Engineering)
 Quinton R. Rogers, Ph.D., Professor
 Henry J. Segall, Ph.D., Assistant Professor
 Philip R. Vulliet, D.V.M., Ph.D., Associate Professor
 Hanspeter Witschi, M.D., Professor *(Medicine, Internal Medicine)*

Emeriti Faculty

Arthur L. Black, Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award*
 Victor W. Burns, Ph.D., Professor Emeritus
 Gaylord M. Conzelman, Jr., Ph.D., Professor Emeritus
 Charles E. Cornelius, D.V.M., Ph.D., Professor Emeritus
 Richard A. Freedland, Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award*

Courses in Molecular Biosciences (VMB)**Lower Division Course**

92. Internship (1-12) I, II, III. The Staff Internship—1-12 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in all subject areas offered in the Department of Molecular Biosciences. Internships supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

192. Internship (1-12) I, II, III, summer. The Staff Internship—1-12 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off

and on campus in all subject areas offered in the Department of Molecular Biosciences. Internships supervised by a member of the faculty. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Graduate Courses

205A. Intermediary Metabolism of Animals (4) I. The Staff

Lecture—4 hours. Prerequisite: a course in biochemistry or physiological chemistry or consent of instructor; a course in physiology recommended. Biochemical data as related to metabolism of intact animals. Pathways and control in biosynthesis and degradation of carbohydrates and lipids; including hormonal, nutritional, and genetics effects. Dynamics of animal metabolism including pools and turnover rates. Offered in alternate years.

205B. Intermediary Metabolism of Animals (3) II.

Rogers, Hansen, Hershey (Biological Chemistry), Rucker (Nutrition)

Lecture—3 hours. Prerequisite: course 205A or consent of instructor. Pathways and control in animals of the biosynthesis and degradation of amino acids, proteins, nucleotides and porphyrins; includes hormonal, nutritional, and genetic effects. Offered in alternate years.

223. Clinical Pharmacokinetics: Concepts and Applications in Comparative Medicine (2) I. Vulliet

Lecture—1 hour; discussion—1 hour. Prerequisite: comparative or veterinary physiology and general pharmacology. Concepts of pharmacokinetics. Absorption and disposition of various drugs, which are used as therapeutic agents, will be compared in different species (man and domestic animals). Course will provide background for research in clinical pharmacology.

***243. Heavy Metal Toxicity and Metabolism (2) II.** Raabe

Lecture—2 hours. Prerequisite: Biological Sciences 102, 103, 104, and Neurobiology, Physiology and Behavior 100B. Toxicity and metabolism of inorganic compounds with emphasis on heavy metals. Examines the relationship between chemical properties and biologic activity of various metals. Includes discussions on metal-protein interactions, genetic disorders in metabolism, chelation therapy, and inorganic carcinogenesis. Offered in alternate years.

***247. Natural Toxicants (2) III.** Segall

Lecture—2 hours. Prerequisite: organic chemistry, Biological Sciences 102 and 103, or consent of instructor. Toxicity and metabolism of natural toxicants with emphasis on the toxic plants present in the western United States. General pathways of metabolism plus the relationship between chemical properties and biologic activity of natural toxicants are discussed. Offered in alternate years.

253. Drug Metabolism (2) II. Buckpitt

Lecture—2 hours. Prerequisite: Biochemistry 101A-101B or Physiological Sciences 101A-101B; consent of instructor. General pathways of drug metabolism and factors influencing the drug metabolism. Emphasis laid upon the species, age, and genetic differences affecting the biological disposition of the drugs. Offered in alternate years.

258. Receptor-Mediated Mechanisms (2) III. Pessah

Lecture—2 hours. Prerequisite: Pharmacology and Toxicology 201 or the equivalent. Survey of modern methods for studying physiological receptors including radioligand binding analysis, ion transport/flux measurements, receptor solubilization and purification strategies, and molecular cloning. Theoretical concepts of receptor-mediated signal transduction, information processing, and mechanisms of drug/toxicant interactions. Offered in alternate years.

258L. Laboratory in Receptor Methods (1) III. Pessah

Laboratory—3 hours. Prerequisite: Molecular and Cellular Biology 120L. Design and practical application of receptor binding techniques including subcellular

fractionation, equilibrium and kinetic radioligand binding studies, receptor activation/inhibition studies, isotopic ion flux measurements, and analysis of data. Limited to 12 students. Offered in alternate years.

260. Toxicologic Pathology (3) II. Witschi, Wilson
Lecture—3 hour. Prerequisite: courses 201, 202, and 203. Provide introduction to organ system pathology; provide understanding of pathogenesis and significance of chemically induced tissue injury in the various organs of the body. Offered in alternate years.

265. Mass Spectrometric Methods in Pharmacology and Toxicology (3) II. Jones
Lecture/discussion—3 hours. Prerequisite: Biological Sciences 102, and Chemistry 128A or 128B or 128C. Intended to enable students in pharmacology, toxicology, and biological chemistry to evaluate and interpret mass spectrometric techniques and results. Emphasis on identification of metabolites and biological macromolecules and quantitative stable isotope methods.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. (S/U grading only.)

297T. Tutoring in Veterinary Pharmacology and Toxicology (1-5) I, II, III. The Staff (Chairperson in Charge)

Students assist in preparation and teaching of courses in Veterinary Pharmacology and Toxicology or other courses offered by the department under direct supervision of the instructor. Designed for graduate or professional students who desire teaching experience. May be repeated for credit up to 5 units. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in Charge)
Prerequisite: consent of instructor. Group study in selected areas of Pharmacology and Toxicology. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

397T. Tutoring in Molecular Biosciences (1-5) I, II, III. The Staff

Prerequisite: graduate or professional student standing and consent of instructor. Designed for graduate or professional students who desire teaching experience, but are not teaching assistants. (S/U grading only.)

405. Veterinary Clinical Pharmacology (2) II. Vulliet
Lecture—2 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. Pharmacological basis of therapeutic use of drugs in domestic animals. Emphasis on selection of most appropriate drug, its dosage form, route of administration and dose for treatment of certain disease conditions. (S/U grading only.)

475. Diagnosis and Treatment of Food Animal and Equine Poisoning (2) III. Mount
Lecture—20 hours. Prerequisite: third-year standing in the School of Veterinary Medicine. Clinical systematic approach to poisoning problems in livestock, horses and other ungulate stock emphasizing diagnosis and treatment. Poisonous plants are covered in this course.

480. Diagnosis and Treatment of Small Animal Poisoning (2) III. Mount
Lecture—20 hours. Prerequisite: third-year standing in the School of Veterinary Medicine. Clinical systematic approach to poisoning problems in dogs, cats, and pet birds, emphasizing diagnosis and treatment.

484. Ruminant Nutrition and Physiology (3) III. Bruss, Morris
Lecture—2.7 hours, laboratory—0.9 hours. Prerequisite: graduate or veterinary student standing. Upper division nutrition courses (e.g., Nutrition 110), upper division systemic physiology (e.g., Neurobiology, Physiology and Behavior 110), biochemistry (e.g., Biological Sciences 102 and 103) or equivalent. Basic and applied aspects of ruminant nutrition and physiology, nutritional and metabolic disorders of ruminants.

Music

(College of Letters and Science)

Christopher Reynolds, Ph.D., Chairperson of the Department

Department Office, 112 Music Building
(916-752-5537; FAX: 752-0983)

Faculty

Ross Bauer, Ph.D., Associate Professor
Robert S. Bloch, M.A., Professor
Anna Maria Busse Berger, Ph.D., Associate Professor
Jonathan Elkus, M.A., Lecturer
Andrew D. Frank, M.A., Professor
Paul Hillier, A.G.S.M., Associate Professor
D. Kern Holoman, Ph.D., Professor, *Academic Senate Distinguished Teaching Award*
Maria Niederberger, Ph.D., Lecturer
David A. Nutter, Ph.D., Professor
Christopher A. Reynolds, Ph.D., Professor
Wayne Lawson, Ph.D., Professor

Emeriti Faculty

Sydney R. Charles, Ph.D., Professor Emeritus
Albert J. McNeil, M.S., Professor Emeritus
Jerome W. Rosen, M.A., Professor Emeritus
Richard G. Swift, M.A., Professor Emeritus, *Academic Senate Distinguished Teaching Award*

Faculty Affiliates in Applied Music

Dona Lee Brandon, M.S.M., Lecturer (*organ*)
Lois Brandwynne, M.A., Lecturer (*piano*)
Tod Brody, B.A., (*flute*)
Phebe Craig, M.M., Lecturer (*harpichord*)
Thomas Derthick, B.M., Lecturer (*string bass*)
Joel Elias, M.M., Lecturer (*trombone*)
Sarah Freiberg, D.M.A., Lecturer (*cello*)
Stephanie Friedman, M.A., Lecturer (*voice*)
David Granger, M.M., Lecturer (*bassoon*)
Edward Higgins, M.M., Lecturer (*trumpet*)
Stanley Lunetta, M.A., Lecturer (*percussion*)
Peter Nowlen, B.M., Lecturer (*French horn*)
Deborah Pittman, M.A., Lecturer (*clarinet*)
Deborah Shidler, B.M.E. (*oboe*)

The UC Davis Contemporary Music Players

Ross Bauer, Director
Tod Brody, flute
Deborah Shidler, oboe
Deborah Pittman, clarinet
David Granger, bassoon
Peter Nowlen, French horn
Betty Woo, piano
Tracy Davis, percussion
Robert Samson Bloch, violin and viola
Sarah Freiberg, cello
Thomas Derthick, bass

The UCD Faculty Woodwind Quintet

Deborah Shidler, oboe
David Granger, bassoon
Deborah Pittman, clarinet
Tod Brody, flute
Peter Nowlen, French horn

The Major Program

The Bachelor of Arts degree in music at UCD provides both a broad liberal arts education and thorough training for a career in music. A fundamental grounding in music theory, music history, and performance during the first two years of study permits a music major to focus upon a special interest area in composition, analysis, history, performance, or secondary-school teaching during the last two years of undergraduate work. Approximately one-half of the music student's college course work is in music, including three years of music theory, two years of music history, and participation in performing groups.

Student Performing Activities. The UCD Department of Music offers performance opportunities in the

UCD Symphony Orchestra, Early Music Ensemble, Concert Band, University Chorus, Chamber Singers, and in chamber music ensembles. The large performing groups regularly present three concerts each year, while chamber ensembles perform frequently in the weekly Thursday Noon Concerts sponsored by the department. The large performing groups also give concerts in off-campus locations, throughout Northern California, and abroad, including recent tours to Europe, China, the Soviet Union, French Polynesia and Australia.

Facilities. The Department of Music's facilities include a large collection of renaissance, baroque, and modern instruments, an electronic studio, practice and rehearsal rooms, and an excellent music library. The library has holdings of well over 20,000 records, tapes, and CDs, and the collection of books and scores in the main library offers exceptional coverage of all aspects of music.

Career Alternatives. Students graduating with a degree in music are well prepared for careers in teaching (high school, community college, or university levels), research, performance, professional composing, concert management, and music librarianship.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	54
Music 2A, 2B, 2C, 4A, 4B, 4C, 5A, 5B, 5C, 24A, 24B, 24C, 25A, 25B, 25C	51
Music 30, 31 (or the equivalent as determined in consultation with major adviser), one year	3
Depth Subject Matter	38
Music 104A, 104B, 104C	12
At least 12 units selected from Music 121, 122, 190	12
At least 6 units selected from Music 107A, 107B, 107C (Note: only 3 units of 107, electronic music, may be counted toward the major), 108A, 108B, 111, 112, 113A, 113B, 198, 199	6
At least 8 units in performance courses	8
Select from Music 130 or 131, 141, 142, 143, 144, 145, 146.	
Total Units for the Major	92

Beginning and transfer students must take an examination in piano playing. Sufficient pianistic ability to perform four-part chorales and compositions comparable in difficulty with *The Little Preludes* of Bach is prerequisite to upper division courses in the major. Students with deficiencies will be required to pass Music 2A, 2B, 2C. All majors in music will be expected to perform the compositions cited above before a jury of faculty members prior to advancement into the upper division. Students transferring from other colleges should take the Placement Examination and consult with departmental major advisers before enrolling in any music course.

Foreign Language Requirement. Attention is called to the requirements in foreign languages for higher degrees in music.

Major Advisers. P. Hillier, D.A. Nutter.

Minor Program Requirements:

	UNITS
Music	22
A minimum of sixteen units of upper division Music courses	16
Courses chosen with adviser's consent from: Music 105, 107, 110, 129	
A minimum of six units in upper division music performance courses (Music 141, 142, 143, 144, 145, 146) may count toward the minor	6
Lower division preparatory work to be determined in consultation with minor advisers.	

Teaching Credential Subject Representative. See also the section on the Teacher Education Program.

*Course not offered this academic year.

Graduate Study. The Department of Music offers programs of study and research leading to the M.A., M.A.T., and Ph.D. degrees. Detailed information regarding graduate study may be obtained from the Graduate Adviser.

Graduate Adviser. A. M. Busse Berger.

Courses in Music (MUS)

Lower Division Courses

1. Basic Musicianship (3) III. Bloch

Lecture—3 hours. Fundamentals of music, singing, ear-training and conducting for beginners in music. Designed for students with career plans where musical literacy is important, for example, primary level classroom teachers, actors, theatre directors, designers, and stage managers. Not open to students who have successfully completed 3A, 4A, or the equivalent.

2A-2B-2C. Keyboard Competence (1-1-1) I-II-III.

The Staff

Laboratory—1 hour. Prerequisite: concurrent enrollment in course 4A-4B-4C; keyboard diagnostic exam (not open for credit to students who have passed the exam). Designed to train students to meet the minimal piano requirements for the major in music. All music majors will be expected to perform scales, modulations, to realize figured basses, and to harmonize a given melody at sight.

3A. Introduction to Music Theory (4) I. Bloch

Lecture—3 hours; laboratory—1 hour. Fundamentals of music theory, ear-training, harmony, counterpoint, and analysis directed toward the development of listening and writing techniques. Intended for the general student. General Education credit for two-course sequence of non-GE courses (3A-3B) which will satisfy requirement for one course: Civilization and Culture.

3B. Introduction to Music Theory (4) II. Bloch

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 3A. Continuation of course 3A. Intended for the general student. General Education credit for two-course sequence of non-GE courses (3A-3B) which will satisfy requirement for one course: Civilization and Culture.

4A-4B-4C. Elementary Theory (5-5-5) I, II, III.

Niederberger

Lecture/discussion—4 hours; practicum—2 hours. Prerequisite: keyboard competence; keyboard diagnostic examination; students must pass the exam or take course 2A-2B-2C concurrently. Development of music writing and listening skills through the study of music fundamentals, tonal species counterpoint, harmony, score reading, analysis of repertoire. Intended primarily for music majors. Students enrolled concurrently in course 2A-2B-2C will receive only 4 units of credit for each quarter of course 4A-4B-4C.

5A-5B-5C. Intermediate Theory (4-4-4) I, II, III.

Frank

Lecture/discussion—3 hours; practicum—2 hours. Prerequisite: course 4C. Study of imitative tonal counterpoint and of harmony; keyboard harmony; analysis of repertoire.

10. Introduction to Musical Literature (4) I. Holoman; II. —; III. Hillier

Lecture—3 hours; listening section—1 hour. An introduction to composers and major styles of Western music. Lectures, listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture.

24A. Introduction to the History of Music, I (4) I.

Reynolds

Lecture—3 hours; listening section—1 hour. Prerequisite: course 4A or 3A (concurrently). Intended primarily for majors in music. History of music from the late Baroque to the Classical Period.

24B. Introduction to the History of Music, II (4) II.

Reynolds

Lecture—3 hours; listening section—1 hour. Prerequisite: course 24A; course 4B or 3B (concurrently). Intended primarily for majors in music. History of music from the Classical Period to the nineteenth century.

24C. Introduction to the History of Music, III (4) III.

Reynolds

Lecture—3 hours; listening section—1 hour. Prerequisite: course 4B or 3B; course 4C (concurrently). Intended primarily for majors in music. History of music from the nineteenth century to the present.

25A. Introduction to the History of Music, IV (4) I.

Busse Berger

Lecture—3 hours; listening section—1 hour. Prerequisite: courses 4C and 24C; course 5A (concurrently). Intended primarily for majors and minors in music. Historical survey of composers and musical styles from antiquity to around 1400.

25B. Introduction to the History of Music, V (4) II.

Nutter

Lecture—3 hours; listening section—1 hour. Prerequisite: courses 5A and 25A; course 5B (concurrently). Intended primarily for majors in music. Historical survey of composers and musical styles from around 1400 to around 1600.

*25C. Introduction to the History of Music, VI (4) III.

Busse Berger

Lecture—3 hours; listening section—1 hour. Prerequisite: courses 5B and 25B; course 5C (concurrently). Intended primarily for majors in music. Historical survey of composers and musical styles from around 1590 to around 1680.

*28. Introduction to Afro-American Music (4) II.

The Staff

Lecture—3 hours; listening and discussion—1 hour. A study of the Afro-American rhythm, field hollers, work songs, spirituals, blues, gospel, and jazz; the contrast between West African, Afro-Caribbean, and Afro-Cuban musical traditions.

30A-U. Applied Study of Music: Intermediate (1) I, II, III. The Staff

Performance instruction—1 hour. Prerequisite: open to Music majors with ability to perform scales and short compositions from standard repertory; admission by audition and consent of instructor. Class instruction, arranged by section: (A) Voice (prerequisite of course 1 or the equivalent); (B) Piano; (C) Harpsichord; (D) Organ; (E) Violin; (F) Viola; (G) Cello; (H) Double Bass; (I) Flute; (J) Oboe; (K) Clarinet; (L) Bassoon; (M) French Horn; (N) Trumpet; (O) Trombone; (P) Tuba; (Q) Percussion; (R) Classical Guitar; (S) Lute; (T) Viola da gamba; (U) Recorder. May be repeated for credit. Offered as demand indicates.

31A-U. Applied Study of Music: Intermediate (Individual) Performance Instruction (2) I, II, III.

The Staff

Performance instruction—1/2 hour; independent practice—5 hours. Prerequisite: open to Music majors only; admission by audition and consent of instructor. Individual instruction in (A) Voice (prerequisite of course 1 or the equivalent); (B) Piano; (C) Harpsichord; (D) Organ; (E) Violin; (F) Viola; (G) Cello; (H) Double Bass; (I) Flute; (J) Oboe; (K) Clarinet; (L) Bassoon; (M) French Horn; (N) Trumpet; (O) Trombone; (P) Tuba; (Q) Percussion; (R) Classical Guitar; (S) Lute; (T) Viola da gamba; (U) Recorder. May be repeated for credit.

41. University Symphony (2) I, II, III. Holoman

Rehearsal—4 hours. Prerequisite: admission subject to audition before the first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Sight-reading, rehearsal, and performance of music from the orchestral literature. May be repeated for credit. (P/NP grading only.)

42. University Chamber Singers (2) I, II, III. Hillier

Rehearsal—3 hours, plus sectionals—at least 1 hour. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of works for small choral group. May be repeated for credit. (P/NP grading only.)

43. University Concert Band (2) II, III. Elkus

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and

performance of music for band. May be repeated for credit. (P/NP grading only.)

44. University Chorus (2) I, II, III. Hillier

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University. Rehearsal and performance of choral music. May be repeated for credit. (P/NP grading only.)

45. Early Music Ensemble (2) I, II, III. Nutter

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of Medieval, Renaissance and Baroque music for vocal ensemble and historical instruments. May be repeated for credit. (P/NP grading only.)

46. Chamber Music Ensemble (1) I, II, III. The Staff (Chairperson in charge)

Rehearsal—2 hours; student practice—1 hour. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Study, rehearsal, and performance of ensemble music for strings, winds, voice, piano, harpsichord, and organ. May be repeated for credit. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III.

The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses

103. Workshop in Composition (3) I, II, III. Frank,

Frank, Neiderberger

Workshop—3 hours. Prerequisite: course 4C. Workshop in musical composition for undergraduates who are interested in pursuing serious compositional techniques. Course will allow students to explore the techniques and materials of musical composition. May be repeated for credit. (P/NP grading only.)

104A-104B-104C. Advanced Theory (4-4-4) I-II-III.

Bauer

Lecture—4 hours. Prerequisite: course 5C. Twentieth-century compositional procedures: analyses and projects in composition.

105. History and Analysis of Jazz (4) III. Bauer

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3A or 10 or the equivalent. Jazz will be studied in its historical and cultural contexts; the evolution of jazz styles will be analyzed. Lectures, discussion/guided listening sections, and selected readings. Designed for non-majors. General Education credit: Civilization and Culture.

*107A. Computer and Electronic Music (3) I.

Slawson

Lecture—3 hours; laboratory—1 hour. Prerequisite: consent of instructor. Studies in electronic and computer music composition. The principles and procedures of composition in various electronic media are explored through compositional exercises. (Limited enrollment.)

*107B. Computer and Electronic Music (3) II.

Slawson

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 107A and consent of instructor. Continuation of course 107A. (Limited enrollment.)

*107C. Computer and Electronic Music (3) III.

Slawson

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 107B and consent of instructor. Continuation of course 107B. (Limited enrollment.)

108A-108B. Orchestration (2-2) II, III. Bloch

Lecture—2 hours. Prerequisite: course 5C. Techniques of orchestration from study of basic instrumental techniques to analysis of orchestral scores and scoring for various instrumental combinations.

*109. Masterworks in Performance (2) I. Holoman

Lecture—2 hours. Prerequisite: course 10 recommended. Thorough score study of a single masterwork to be performed on campus during the quarter. Guided listening, selected readings, analysis and study of composer's milieu. Recommended especially for members of the performing ensembles scheduled to present the work.

110A. The Music of a Major Composer:

Beethoven (4) I. Busse Berger
Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or 3A-3B. The work of Beethoven will be studied in the context of his time and his contemporaries. Lectures, discussion/guided listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture.

110B. The Music of a Major Composer:

Stravinsky (4) II. Frank
Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or 3A-3B. The work of Stravinsky will be studied in the context of his time and his contemporaries. Lectures, discussion/guided listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture.

110C. The Music of a Major Composer: Bach (4)

III. Elkus
Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or 3A-3B. The work of Bach will be studied in the context of his time and his contemporaries. Lectures, discussion/guided listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture.

***110D. The Music of a Major Composer: Mozart**

(4)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or 3A-3B. The work of Mozart will be studied in the context of his time and his contemporaries. Lectures, discussion/guided listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture.

***110E. The Music of a Major Composer: Haydn** (4)

Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or 3A-3B. The work of Haydn in the context of his time and his contemporaries. Lectures, discussion/guided listening sections, and selected readings. For non-majors. Offered in alternate years. General Education credit: Civilization and Culture.

111. Choral Conducting (2) I. Hillier

Lecture—2 hours. Prerequisite: courses 4A-4B-4C and consent of instructor. Principles and techniques of conducting choral ensembles.

***112. Instrumental Conducting** (2) I. Holoman

Lecture—2 hours. Prerequisite: courses 4A-4B-4C and consent of instructor. Principles and techniques of conducting instrumental ensembles. Offered in alternate years.

121. Topics in Music History and Criticism (4) I.

Nutter; II. Busse Berger; III. Holoman
Seminar—4 hours (includes selected listening). Prerequisite: courses 4A-4B-4C, 24A-24B-24C, and consent of instructor. Sources and problems of a historical period or musical style selected by the instructor and announced in advance. May be repeated for credit.

***122. Topics in Analysis and Theory** (4) II. Slawson;

III. Bauer
Seminar—4 hours (includes selected listening). Prerequisite: courses 5C and 25C. Analysis of works of a composer or musical style selected by the instructor and announced in advance. Consideration of theoretical issues. May be repeated for credit.

***126. American Music** (4) Hillier

Lecture—3 hours; listening—1 hour. Prerequisite: course 10 or 3A-3B or consent of instructor. Introductory survey of American musics, including Native American music, Hispanic polyphony, New England psalmody, and selected 20th-century composers and styles. Offered in alternate years.

***129. World Music** (4) The Staff

Lecture—3 hours; listening—1 hour; selected readings. Prerequisite: course 3A-3B or 10 recommended. Intended for non-majors. Studies in selected areas of non-western music, including appropriate instrumental and performing techniques, analysis of tonal systems, melody, rhythm and musical structures. Emphasis placed on cultural context of the music. General Education credit: Civilization and Culture.

130A-U. Applied Study of Music: Advanced (1) I,

II, III. The Staff
Performance instruction—1 hour. Prerequisite: open

to Music majors with ability to perform scales and short compositions from standard repertoire; admission by audition and consent of instructor. Class instruction, arranged by section: (A) Voice (prerequisite of course 1 or the equivalent); (B) Piano; (C) Harpsichord; (D) Organ; (E) Violin; (F) Viola; (G) Cello; (H) Double Bass; (I) Flute; (J) Oboe; (K) Clarinet; (L) Bassoon; (M) French Horn; (N) Trumpet; (O) Trombone; (P) Tuba; (Q) Percussion; (R) Classical Guitar; (S) Lute; (T) Viola da gamba; (U) Recorder. May be repeated for credit. Offered as demand indicates.

131A-U. Applied Study of Music: Advanced

(Individual) (2) I, II, III. The Staff
Performance instruction—1/2 hour; independent practice—5 hours. Prerequisite: open to Music majors only; admission by audition and consent of instructor. Individual instruction in (A) Voice (prerequisite of course 1 or the equivalent); (B) Piano; (C) Harpsichord; (D) Organ; (E) Violin; (F) Viola; (G) Cello; (H) Double Bass; (I) Flute; (J) Oboe; (K) Clarinet; (L) Bassoon; (M) French Horn; (N) Trumpet; (O) Trombone; (P) Tuba; (Q) Percussion; (R) Classical Guitar; (S) Lute; (T) Viola da gamba; (U) Recorder. May be repeated for credit.

141. University Symphony (2) I, II, III. Holoman

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Sight-reading, rehearsal and performance of music from the orchestral literature. May be repeated for credit. (P/NP grading only.)

142. University Chamber Singers (2) I, II, III. Hillier

Rehearsal—3 hours, plus sectionals—at least 1 hour. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of works for small choral group. May be repeated for credit. (P/NP grading only.)

143. University Concert Band (2) II, III. Elkus

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for band. May be repeated for credit. (P/NP grading only.)

144. University Chorus (2) I, II, III. Hillier

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University. Rehearsal and performance of choral music. May be repeated for credit. (P/NP grading only.)

145. Early Music Ensemble (2) I, II, III. Nutter

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of Medieval, Renaissance, and Baroque music for vocal ensemble and historical instruments. May be repeated for credit. (P/NP grading only.)

146. Chamber Music Ensemble (1) I, II, III. The Staff

(Chairperson in charge)
Rehearsal—2 hours; student practice—1 hour. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Study, rehearsal, and performance of ensemble music for strings, winds, voice, piano, harpsichord, and organ. May be repeated for credit. (P/NP grading only.)

***190. Senior Seminar in Music** (4) I. The Staff

(Chairperson in charge)
Lecture—4 hours. Prerequisite: courses 5C and 25C, and consent of instructor; course 104C recommended. Intended primarily for majors in music intending to apply for graduate programs in music history, composition, or theory. Review of musical skills, issues in theory and analysis, and the history and literature of music.

198. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates

(1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses**200. Music Research** (4) III. Busse Berger

Seminar—3 hours; term paper. Introduction to problems and techniques of research; practical application of music bibliography to questions about significant issues in musicology, music theory, and performance practice.

***201. Advanced Music Research and Criticism** (4)

II. Swift
Seminar—3 hours; term paper. Study and practice of expository writing about music. Application of advanced research techniques in writing for different purposes, ranging from essays for the general public to thesis proposals and articles for scholarly journals.

***202. Notation** (4) III. Busse Berger

Seminar—3 hours; term paper. Study of musical notation; investigation of techniques for editing Medieval and Renaissance music.

203A-203B-203C. Composition (4-4-4) I, II, III.

Bauer
Seminar—3 hours. Technical projects and free composition.

***204. Advanced Conducting** (3) I, II, III. The Staff

(Holoman in charge)
Tutorial—2 hours; practicum—2 hours. Prerequisite: courses 111, 112, or the equivalent; keyboard skills appropriate to graduate standing. Technical aspects of conducting and the broader issues in music history and analysis that conductors must face before leading a rehearsal or performance.

***207. Advanced Electronic and Computer Music**

(4) III. Slawson
Seminar—2 hours; plus individual student/instructor meeting—2 hours. Prerequisite: courses 107A-107B-107C. Advanced composition of computer and electronic music with the Sun 3-based computer-music system and associated facilities.

210A. Proseminar in Music (Theory and Analysis)

(4) I. Slawson
Seminar—3 hours; term paper. Voice-leading analysis of tonal music derived from Schenker and pitch-class set theory. Recent work on compositional design, generalizations of the concept of interval, psychologically-oriented music theory, and theories of durational structure and timbre.

210B. Proseminar in Music (Musicology and Criticism)

(4) II. Busse Berger
Seminar—3 hours; term paper. Issues and concepts of music history, including performance practice questions for specific repertoires and periods; principles, aims, and methods of archival study; historical theory; evolution of musical styles; philosophical debates about goals and aims of the discipline in general.

***210C. Proseminar in Music (Ethnomusicology)**

(4) III. The Staff
Seminar—3 hours; term paper. Intensive examination of major trends in ethnomusicology as exemplified by scholars working in several non-Western cultures. Ethnomusicological theory, ranging from ethnographic description to metamusicological study (Seegar) to analysis of individual genres to sociological study.

221. Topics in Music History (4) I. Reynolds; III.

Nutter
Seminar—3 hours. Studies in selected areas of music history and theory. May be repeated for credit.

222. Techniques of Analysis (4) II. Bauer

Seminar—3 hours. Analysis and analytical techniques as applied to music of all historical style periods. May be repeated for credit.

***223. Ethnomusicology (Pacific Cultures)** (4)

Seminar—3 hours; term paper. Court music, religious music, and popular forms of China, Japan, Korea, Melanesia, and Indochina. Issues concerning history, theoretical constructs, performance practice, and cultural settings of the music will be stressed. May be repeated for credit.

299. Individual Study (1-12) I, II, III. The Staff

(Holoman in charge)
(S/U grading only.)

Teaching Methods Courses

***300. The Teaching of Music (3) II.** The Staff
Lecture—3 hours. Prerequisite: course 1 or the equivalent. Methods of teaching music in grades K-6.

***301. The Teaching of Music (3) II.** The Staff
Lecture—3 hours. Prerequisite: course 5C (or the equivalent). Methods of teaching music in grades 7-12.

Instrumental Methods. The courses in this series consider methods of teaching orchestra and band instruments, and include repertory and program planning for secondary schools.

***321A-321B. Stringed Instruments (1-1) I-II.** The Staff
Discussion—2 hours. Prerequisite: course 4C.

***322. Brass Instruments (1) III.** The Staff
Laboratory—2 hours. Prerequisite: course 4C. Offered in alternate years.

***323A-323B. Woodwind Instruments (1-1) II-III.** The Staff
Discussion—2 hours. Prerequisite: course 4C.

***324. Percussion Instruments (1) II.** Lunetta
Laboratory—2 hours. Prerequisite: course 4C. Considers teaching of percussion instruments. Survey course. Offered in alternate years.

Native American Studies

(College of Letters and Science)

Jack D. Forbes, Ph.D., Chairperson of the Department

Department Office, 2401 Hart Hall (916-752-3237)

Faculty

- Steven J. Crum, Ph.D., Assistant Professor
- Jack D. Forbes, Ph.D., Professor
- Inés Hernandez, Ph.D., Assistant Professor
- George C. Longfish, M.F.A., Professor
- Martha J. Macri, Ph.D., Assistant Professor
- Stefano Varese, Ph.D., Professor

Emeriti Faculty

- Carl N. Gorman, M.F.A., Lecturer Emeritus
- Sarah Hutchison, M.A., Lecturer Emeritus
- David Risling, M.A., Senior Lecturer Emeritus

The Major Program

Native American studies focuses upon the indigenous peoples of both North and South America. The program is interdisciplinary in its approach to the world of the American Indian and offers a comprehensive and comparative perspective.

The Program. Students electing a major in Native American studies may complete Plan I, Plan II, or Plan III. Plan I enables students to concentrate chiefly upon the Native experience in North America (north of Mexico). Plan II encourages interested students to focus upon Meso-America with, however, some course work integrating Meso-America with North America and South America. Plan III focuses upon South America, with some course work integrating that region with areas to the north.

Career Alternatives. Native American studies is excellent preparation for a professional career such as teaching, law, human services, health, tribal administration, social work, and inter-ethnic relations. Graduate schools and agencies in these and related areas are looking for students with broad interdisciplinary preparation and who possess knowledge and sensitivity relating to ethnic issues and cultural diversity.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter (Plans I, II, and III)20

Native American Studies 14
Native American Studies 32, 33, 46, 55, 70, or three of the above courses and one course from History 17A, History 22, Anthropology 2 or 316

Depth Subject Matter (Plans I, II, and III)16

Native American Studies 130A4
Native American Studies 130B or 130C4
Native American Studies 1574
Native American Studies 1804

Plan I (North American Emphasis)

Preparatory Subject Matter (see above).....20
Depth Subject Matter (see above).....16
Two courses from Native American Studies 115, 116, 117, 118, 122, 130C.....8
Two courses from Native American Studies 101, 181A, 181B, 181C.....8
Two courses from Anthropology 113, 134, 141A, 141B, 145, 146, 172, 173, 174, 175, 176, Geography 120, History 173A8
One other upper division Native American Studies course, selected in consultation with your major adviser4

Total Units for the Major, Plan I64

Plan II (Mexico-Central America Emphasis)

Preparatory Subject Matter (see above).....20
Depth Subject Matter (see above).....16
Native American Studies 1334
Two courses from History 161A, 166A, 166B, Geography 122A.....8
Two courses from Anthropology 134, 145, 146, 174, 175, Chicano Studies 130, Native American Studies 1228
One course from Spanish 129, 135, Art 151...4
One course from Native American Studies 101, 181A, 181B, 181C, or from 107, 188, 191 if specifically focused upon a Meso-American language or topic4

Total Units for the Major, Plan II64

Plan III (South American Emphasis)

Preparatory Subject Matter (see above).....20
Depth Subject Matter (see above).....16
Native American Studies 1204
Two courses from History 161A, 161B, 162, 163A, 163B, 165, Geography 122B.....8
Two courses from Anthropology 134, 144, 174, 175, Native American Studies 1228
Two courses from Native American Studies 101, 181A, 181B, 181C, Spanish 149, or from Native American Studies 107, 188, 191 if specifically focused upon a South American language or topic8

Total Units for the Major, Plan III64

Minor Program Requirements:

The Native American Studies minor provides an introduction to the Native experience in the Americas by means of exposure to course work dealing with some of the major aspects of Indian life, including history, values, politics, literature, and art.

Native American Studies24

Native American Studies 1 or 104
Five upper division courses, at least one of which is chosen from each of the following groups20
Ethno-History, Native American Studies 130A, 130B, 130C, or 133
Philosophy and values, Native American Studies 156, 157, or 180
Politics and current affairs, Native American Studies 115, 116, 117, 118, 120, 122
Art and literature, Native American Studies 101, 181A, 181B, or 181C
One other upper division course selected in consultation with adviser.

Courses in Native American Studies (NAS)

Lower Division Courses

1. Introduction to Native American Studies (4) I.

The Staff; II, III. Crum
Lecture/discussion—4 hours. Introduction to Native American Studies with emphasis upon basic concepts relating to indigenous American tribal and reservation societies, including intergenerational relations.

10. Native American Experience (4) I. Macri; II, III.

The Staff
Lecture—4 hours. Introduction to American Indian historical and socio-cultural development with emphasis upon the U.S. area and upon those processes such as relations with non-Indians which have contributed to the current condition of Indian people. General Education credit: Contemporary Societies.

***32. Native American Music and Dance (4)**

Lecture/discussion—4 hours. Introduction to the music and dance of the native peoples of the Americas. Students will study secular native music and dance from a cross-section of regions and tribes.

***33. Native American Art in the U.S. (4) I. Longfish**

Lecture—4 hours. Comprehensive survey of Indian art forms with emphasis upon design, media, and function. Intent is to familiarize the student with a wide range of styles and techniques.

34. Native American Art Workshop (4) II, III. Longfish

Lecture—1 hour; laboratory—6 hours; to be arranged—3 hours. Prerequisite: consent of instructor; course 33 recommended. Studio projects in Native-American art, design, and crafts. (P/NP grading only.)

***46. Orientation to Research in Native American Studies (4) II. Forbes**

Lecture/discussion—3 hours; term paper. Prerequisite: Native American Studies major or minor, or consent of instructor. Introduces students to basic research resources pertinent to Native American subjects available in the region, including libraries, archives, museums, etc. Emphasis is upon learning to use documentary resources or other collections of data. Students will carry out individual projects. Limited enrollment.

55. Americanisms: Native American Contributions to World Civilization (4) II. Varese

Lecture/discussion—4 hours. Prerequisite: course 1 or 10 recommended. American indigenous people's contributions to the contemporary world, with attention to forced participation of Indian societies in the development of Western dominance and resulting appropriation of cultural creations. Responses and initiatives of indigenous peoples will be analyzed. General Education credit: Contemporary Societies.

99. Special Study for Undergraduates (1-5) I, II, III.

The Staff (Forbes in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Contemporary Indian Art (4) II. Longfish

Lecture—4 hours. Prerequisite: course 33. Historical review of contemporary Indian art from 1900 to the present by looking at the two art centers of Oklahoma and Santa Fe. Social pressures that have influenced the imagery that exists today will be examined.

107. Special Topics in Native American Languages (4) II. Macri

Lecture/discussion—4 hours. Prerequisite: consent of instructor. Investigation of various subjects in contemporary and historical Native American language studies. May be repeated for credit when a different topic is studied.

***112. History and Culture of the "Five Civilized Tribes" (4) II. Hutchison/Wilson**

Lecture—4 hours. Prerequisite: upper division standing; course 1. History and culture of the Native American people, found in southeastern part of the U.S., called the "Five Civilized Tribes." Offered in alternate years.

*Course not offered this academic year.

***115. Native Americans in the Contemporary World** (4) III. Forbes

Lecture/discussion—4 hours. Prerequisite: course 1, 10, or 55. The sociocultural development of American Indian populations in modern times with emphasis upon North America. Attention will be given to contemporary Indian affairs and problems as well as to the background for present day conditions. Not open for credit to students who have completed Anthropology 141B. (Former course Anthropology 141B.) General Education credit: Contemporary Societies.

***116. Native American Traditional Governments** (4) II. The Staff

Lecture—4 hours. Prerequisite: course 1; Anthropology 2. Study of selected Native American Tribal Governments, confederations, leagues, and alliance systems. Offered in alternate years.

***117. Native American Governmental Decision Making** (4) II. The Staff

Lecture—4 hours. Prerequisite: course 116, Political Science 2; Anthropology 123 recommended. Native American governmental and community decision making with emphasis on federal and state programs, tribal sovereignty, current political trends and funding for tribal services. Offered in alternate years.

***118. Native American Politics** (4) III. The Staff
Lecture—4 hours. Prerequisite: course 117. Examination of the various interest groups and movements found among Native people and how they relate to the determination of Indian affairs. Study of political action available to Native groups, and local communities, along with relevant theory relating to underdevelopment. Offered in alternate years.

120. Ethnopolitics of South American Indians (4) I. Varese

Lecture/discussion—4 hours. Prerequisite: course 1, or 55. Social, political, cultural movements of indigenous South Americans in response to establishment, expansion of European colonialism, post-colonial nation-states. Ethnopolitical processes developed through interactions between Indians, Euroamericans. Socioethnographic analysis of main indigenous areas and the development of national societies.

122. Native American Community Development (4) II. Varese

Lecture—4 hours. Prerequisite: course 1, Applied Behavioral Sciences 151. Application of community development theory and techniques to the development problems of Native American communities. Offered in alternate years. (Former course 161.)

130A. Native American Ethno-Historical Development (4) I. Crum

Lecture—4 hours. Prerequisite: course 1 or 10; History 17A recommended. Study of Native American ethno-history in North America before 1770's. General Education credit: Civilization and Culture.

130B. Native American Ethno-Historical Development (4) II. Crum

Lecture—4 hours. Prerequisite: course 1; History 17A-17B recommended. Study of Native American ethno-history in North America, 1770-1890. General Education credit: Civilization and Culture.

130C. Native American Ethno-Historical Development (4) III. Crum

Lecture—4 hours. Prerequisite: course 1; History 17A-17B recommended. Study of Native American ethno-history in North America after 1890. General Education credit: Contemporary Societies.

133. Ethnohistory of Native People of Mexico and Central America (4) II. Varese

Lecture/discussion—4 hours. Prerequisite: course 1, 10 or 55. Ethnohistorical development of pre-colonial, colonial, post-colonial Mexican and Central American indigenous people; the impact of economic and political factors on the process of cultural adaptation. Attention is given to the questions of nation-building, forced assimilation, indigenous resistance, organized political responses.

156. Native American Ethics and Value Systems (4) II. Forbes

Lecture—4 hours. Prerequisite: upper division standing; course 1. Analysis of Native American systems of

values and how these values translate into actual behavior; attention to the problem of implementing traditional values in the twentieth century and the possible impact of native values in modern societies. Offered in alternate years. General Education credit: Civilization and Culture.

157. Native American Religion and Philosophy (4) II. Hernandez

Lecture—4 hours. Prerequisite: upper division standing; course 1 or Anthropology 2. Religious and philosophical thinking of Native American people with emphasis upon North America. Offered in alternate years.

180. Native American Women (4) III. Hernandez

Lecture/discussion—4 hours. Prerequisite: course 1 or 10 or Women's Studies 50. Social and cultural foundations of the Native American women's personality, including the development of the Indian girl and the life phases of mature womanhood. Autobiographical and biographical text will be utilized. General Education credit: Contemporary Societies.

181A-181B-181C. Native American Literature

(4-4-4) I-II-III. Hernandez
Lecture—4 hours. Prerequisite: English 3, Comparative Literature 1, 2, 3, or any course from the General Education Literature Preparation List. Analysis of works by or about Native Americans including novels and autobiographies, analysis of Native American poetry, oral literature, songs, and tales. (A), the novel and fiction; (B), nonfiction works by native authors; (C), traditional literature and poetry. Offered in alternate years. General Education credit: Civilization and Culture.

188. Special Topics in Native American Literary Studies (4) I, II, III. The Staff

Lecture/discussion—3 hours; term paper. Prerequisite: upper division standing and consent of instructor. Special topics drawn from Native American literature. May be repeated for credit when a different topic is studied.

***190. Seminar in Native American Studies** (2) III.

The Staff (Forbes in charge)
Discussion—2 hours. Prerequisite: senior standing. Seminar of critical issues faced by Native American people. (P/NP grading only.)

191. Topics in Native American Studies (4) I, II, III. The Staff

Lecture/discussion—3 hours; term paper. Prerequisite: upper division standing and consent of instructor. Selected topics in Native American ethno-history, development, culture, and thought. May be repeated for credit when a different topic is studied.

194HA-194HB. Special Studies for Honors Students (4-4) I-II. The Staff (Forbes in charge)

Independent study—12 hours. Prerequisite: senior qualifying for honors. Directed reading, research and writing culminating in the completion of a senior honors thesis or project under direction of faculty adviser. (Deferred grading only, pending completion of sequence.)

195. Field Experience in Native American Studies (12) I, II, III. Forbes in charge

Field work—36 hours. Prerequisite: senior standing and major in Native American Studies, completion of lower division major requirements, and course 161. Field work with governmental and community groups, under supervision of faculty adviser and sponsor. Knowledge acquired in other courses to be applied in field work. (P/NP grading only.)

196. Senior Project in Native American Studies (4) I, II, III. Forbes in charge

Discussion—1 hour; independent study—3 hours. Prerequisite: senior standing and major in Native American Studies, course 195 (may be taken concurrently), and consent of instructor. Guided research project that enables student to apply the theory and research principles from major course work. Final product is to be a major senior project or thesis. (P/NP grading only.)

197TC. Community Tutoring in Native American Studies (1-5) I, II, III. The Staff (Forbes in charge)

Tutorial—3-15 hours. Prerequisite: consent of major committee; upper division standing with major in

Native American Studies. Supervise tutoring in community. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Forbes in charge)

Prerequisite: upper division standing; consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Forbes in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses***200. Basic Concepts in Native American Studies** (4) II. Crum

Seminar—4 hours. Prerequisite: graduate standing and consent of instructor. Analysis of the characteristics of the discipline of Native American Studies. Concentration is on both traditional and contemporary native scholarship and thought as well as the theoretical and methodological consequences derived from application of these ideas. Offered in alternate years.

202. Advanced Topics in Native American Studies (4) II. The Staff (Forbes in charge)

Seminar—4 hours. Prerequisite: graduate standing. Advanced study of selected topics or themes relevant to the field of Native American studies. Topics will be announced at the time of offering. May be repeated for credit when topic differs.

***212. Community Development for Sovereignty and Autonomy** (4) I. Varese

Seminar—4 hours. Prerequisite: graduate standing and consent of instructor. Examines a sample of contemporary indigenous communities from south, central and north America with the goal of understanding and evaluating the strategies adopted by Native American communities to develop and implement forms of sovereignty or autonomous self-management. Offered in alternate years.

***220. Colonialism/Racism and Self-Determination** (4) III. Varese/Macri

Seminar—3 hours; term paper. Prerequisite: graduate standing. Study of imperial/colonial systems and their psychosocial impacts upon oppressors and oppressed, of racism as the outgrowth of colonialism, and of nationalism, ethnic conflict and self-determination. Focus on indigenous peoples, but other groups will also be considered. Offered in alternate years.

***280. Ethnohistorical Theory and Method** (4) II. Forbes

Seminar—3 hours; term paper. Discussion of the ethnohistorical method; the utilization of diverse types of data, especially documentary sources, to reconstruct socio-cultural history. Particular attention to the applied area of ethnohistory in the solution of contemporary social problems. Offered in alternate years.

298. Group Study for Graduate Students (1-5) I, II, III. The Staff (Forbes in Charge)

Prerequisite: graduate standing, consent of instructor. (S/U grading only.)

299. Special Study for Graduate Students (1-12) I, II, III. The Staff (Forbes in Charge)

Prerequisite: graduate standing, consent of instructor. (S/U grading only.)

Nature and Culture

(College of Letters and Science)

Mark Wheelis, Ph.D., Program Director

Program Office, 2202 Storer Hall (916-752-0562)

Committee in Charge

Francisco X. Alarcon (*Spanish and Classics*)

Michael Barbour, Ph.D. (*Environmental Horticulture*)

Richard Cowen, Ph.D. (*Geology*)

Paula Findlen, Ph.D. (*History*)

Scott McLean, Ph.D. (*Comparative Literature*)

Ben Orlove, Ph.D. (*Environmental Studies*)

Art Shapiro, Ph.D. (*Evolution and Ecology*)

Lenora Timm, Ph.D. (*Linguistics*)

Robert Torrance, Ph.D. (*Comparative Literature*)
Mark Wheelis, Ph.D. (*Microbiology*)

Faculty

Michael Barbour, Ph.D., Professor (*Environmental Horticulture*)
Scott McLean, Ph.D., Lecturer (*Comparative Literature*)
Benjamin Orlove, Ph.D., Professor (*Environmental Studies*)
Lenora Timm, Ph.D., Professor (*Linguistics*)
Mark Wheelis, Ph.D., Senior Lecturer (*Microbiology*)

Minor Program Requirements:

	UNITS
Nature and Culture 1.....	4
Nature and Culture 100.....	4
Environmental Studies 100, Zoology 125 or Botany 101.....	3-4
Anthropology/Environmental Studies 101....	4
Anthropology/Environmental Studies 133....	4
English 184 or Native American Studies 181A, 181B, or 181C.....	4
Total units for the minor.....	23-24

Courses in Nature and Culture (NAC)

Lower Division Courses

1. Intersections of Nature and Culture (4) III.

McLean, Wheelis

Lecture/discussion—3 hours; term paper. Satisfaction of Subject A requirement; Comparative Literature 1, 2 or 3, or English 3 recommended. Nature and culture as human constructs, conditioned by both time and place; importance of nature in human thought, both scientific and spiritual; scientific and literary view of the relation between nature and culture, including forms of observation and methods of analysis.

98. Directed Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. (P/NP grading only.)

99. Individual Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

*100. The Culture of Nature: Theoretical Frameworks and Case Studies (4) II.

Orlove, Timm

Lecture/discussion—3 hours; term paper. Prerequisite: course 1, Biological Sciences 1C, and Comparative Literature 20; and Comparative Literature 1, or 2, or 3, or English 3. In-depth study of one or two problems in nature and culture, with particular attention to integrative theoretical frameworks available for the investigation of specific issues. Case studies will vary with instructor. May be repeated for credit.

180. Fieldwork in Nature and Culture (4) I.

Barbour, McLean

Discussion—1 hour; fieldwork—70 hours/quarter; term paper. Prerequisite: course 100. Fieldwork: one week prior to the beginning of the quarter, plus two weekends. Natural scientific, social scientific, and literary/artistic approaches to the study of nature and culture in one place, which will vary with instructor.

197T. Tutoring in Nature and Culture (1-5) I, II, III.

The Staff

Tutoring—3-15 hours. Prerequisite: consent of instructor. Assist in field trips, lead study sessions with groups and individual students. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. (P/NP grading only.)

199. Individual Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. (P/NP grading only.)

Nematology

(College of Agricultural and Environmental Sciences)
Harry K. Kaya, Ph.D., Chairperson of the Department
Department Office, 354 Hutchison Hall
(916-752-6905)

Faculty

Edward P. Caswell-Chen, Ph.D., Assistant Professor
Howard Ferris, Ph.D., Professor
Scott L. Gardner, Ph.D., Assistant Professor
Bruce A. Jaffee, Ph.D., Associate Professor
Harry K. Kaya, Ph.D., Professor (*Entomology*)
Becky B. Westerdahl, Ph.D., Lecturer
Valerie M. Williamson, Ph.D., Associate Professor

Emeriti Faculty

Benjamin F. Lowensbery, Ph.D., Professor Emeritus
Armand R. Maggenti, Ph.D., Professor Emeritus
Dewey J. Raski, Ph.D., Professor Emeritus

Minor Program Requirements:

	UNITS
Nematology.....	18-20

Nematology 100, 110, and Veterinary Microbiology 132..... 11

Two or three courses from one of the following areas..... 7-9

(a) *Plant Science*: Microbiology 102, Botany 120, 121, Entomology 100, 115, 153, 156, 156L, Soil Science 111, Zoology 112, 142.

(b) *Entomology*: Microbiology 102, Botany 120, 121, one upper division Entomology course, Soil Science 100, 111, Zoology 112, 142.

Minor Adviser. C.Y.S. Peng.

Graduate Study. Graduate degrees specializing in Nematology are offered through the Departments of Entomology and Plant Pathology, and through various Graduate Groups (Biochemistry, Ecology, Genetics, Plant Protection and Pest Management). Refer to the Graduate Studies section in this catalog for details.

Courses in Nematology (NEM)

Upper Division Courses

100. General Plant Nematology (4) I.

Ferris
Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A or 10. An introduction to the classification, morphology, biology, and control of the nematodes attacking cultivated crops.

110. Introduction to Nematology (2) II.

Gardner
Lecture—2 hours. Prerequisite: Biological Sciences 1B or the equivalent or consent of instructor. The relationship of nematodes to human environment. Classification, morphology, ecology, distribution, and importance of nematodes occurring in water and soil as parasites of plants and animals.

199. Special Study for Advanced Undergraduates (1-5) I, II, III, summer. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

*220. Principles and Techniques of Nematode Taxonomy and Morphology (4) III.

The Staff
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100. Analysis and evaluation of the techniques used in the collection, extraction, and preparation of specimens, free-hand and histologic sections; presentation of illustrative material. Offered in alternate years.

*222. Advanced Plant Nematology (3) II.

Caswell-Chen, Jaffee, Williamson
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 100 or the equivalent. Review and investigation of relationship between parasitic nematodes and plants, the relationship between nematodes and their environment, and the relationship between nematodes and other biota. Biology of systems explored at

the population, organism, and cellular levels. Offered in alternate years.

225. Nematode Taxonomy and Comparative Morphology (5) II.

Gardner

Lecture—2 hours; laboratory—6 hours; 3 hours of laboratory to be announced. Prerequisite: course 220. The taxonomy, morphology, and comparative morphology of soil, freshwater, and marine nematodes as well as select plant and animal parasites. Offered in alternate years.

240. Biological Control in Insect and Plant Nematology (2) I.

Jaffee, Kaya

Lecture—1 hour; laboratory—3 hours or field trips. Prerequisite: upper-division course in entomology, nematology, or plant pathology. Biological control potential of nematodes against insect pests and of microorganisms against nematode pests. Offered in alternate years.

245. Field Nematology (1) I.

The Staff
Fieldwork—6 days. Prerequisite: courses 100, 222. Six-day demonstration and field study in applied nematology including diagnosis and prediction of nematode field problem strategies for control field plot design, and establishment in association with diverse California crops. (S/U grading only.)

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour. (S/U grading only.)

290C. Advance Research Conference (1) (Research Faculty)

Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Planning and results of research programs, proposals, and experiments. Discussion and critical evaluation of original research being conducted by the group. Discussion led by individual research instructors for research group. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

Neuroscience (A Graduate Group)

Brian Mulloney, Ph.D., Chairperson of the Group
Group Office, 188 Briggs Hall (916-752-9092)

Faculty. The group includes 28 faculty members from fourteen departments in the College of Agricultural and Environmental Sciences, College of Letters and Science, and the Schools of Medicine and of Veterinary Medicine.

Graduate Study. The Graduate Group in Neuroscience offers programs of study leading to the Ph.D. degree. Neuroscience is a broad, interdepartmental program with faculty interests ranging from molecular biophysics of channels to cortical organization and cognition. A major goal of the program is to prepare students for careers as research scientists. Details of the program may be obtained from the Group office.

Graduate Advisers. A. Ishida (*Neurobiology, Physiology and Behavior*), R. Rafal (*Center for Neuroscience*).

Courses in Neuroscience (NSC)

Graduate Courses

200LA. Laboratory Methods in Neurobiology (6) I, II, III. The Staff

Laboratory—18 hours. Prerequisite: graduate standing in the Neuroscience Graduate Group. Individual research in the laboratory of a faculty member. Research problems will emphasize the use of contemporary methods and good experimental design. May be repeated for credit.

200LB. Laboratory Methods in Neurobiology (3) I, II, III. The Staff
 Laboratory—9 hours. Prerequisite: graduate standing in the Neuroscience Graduate Group. Individual research in the laboratory of a faculty member. Research problems will emphasize the use of contemporary methods and good experimental design. May be repeated for credit.

210. Contemporary Research in Neurobiology (3) I. The Staff (Chairperson in charge)
 Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing in Neuroscience or consent of instructor. Series of lectures by faculty members presenting the intellectual and technical basis for their own research. May be repeated for credit once with consent of instructor.

243. Topics in Cellular and Behavioral Neurobiology (2) III. Wilson
 Discussion—1 hour; seminar—1 hour. Prerequisite: consent of instructor. An advanced examination of several current problems in neurobiology. Topics will vary in different years; may be repeated for credit. (S/U grading only.)

250. Biology of Neuroglia (2) III. Vijayan
 Lecture/discussion—1.5 hours. Prerequisite: consent of instructor. The properties and functions of non-neuronal or neuroglial cells in the mammalian central nervous system with relevance to neuronal development, physiology and injury response. Offered in alternate years. (Same course as Cell Biology and Human Anatomy 250.) (S/U grading only.)

283. Neurobiological Literature (1) I, II, III. Mul-loney and Wilson
 Seminar—1 hour. Prerequisite: consent of instructor. Critical presentation and analysis of recent journal articles in neurobiology. (S/U grading only.)

290C. Research Conference in Neurobiology (1) I, II, III. The Staff (Chairperson in charge)
 Discussion—1 hour. Prerequisite: graduate standing in Neuroscience or consent of instructor; course 299 (concurrently). Presentation and discussion of faculty and graduate student research in neurobiology. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
 (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
 (S/U grading only.)

Neurology

See Medicine, School of

Neurosurgery

See Medicine, School of

Nutrition

See Community Nutrition; Dietetics; Nutrition (below); Nutrition (A Graduate Group); Nutrition Science; and Clinical Nutrition and Metabolism (under Internal Medicine in Medicine, School of

Nutrition

(College of Agricultural and Environmental Sciences)
 Carl L. Keen, Ph.D., Chairperson of the Department
 Department Office, 3135 Meyer Hall (916-752-4630)

Faculty

Lindsay H. Allen, Ph.D., Professor
 Kenneth H. Brown, M.D., Professor
 Andrew J. Clifford, Ph.D., Professor
 Kathryn G. Dewey, Ph.D., Professor
 M.R.C. Greenwood, Ph.D., Professor
 Louis E. Grivetti, Ph.D., Professor (Nutrition, Geography)

Patricia Johnson, Adjunct Professor
 Carl L. Keen, Ph.D., Professor (Nutrition, Internal Medicine)

Bo L. Lonnerdal, Ph.D., Professor (Nutrition, Internal Medicine)

Roger McDonald, Ph.D., Assistant Professor
 Jo Ann Prophet, M.S., Lecturer

Robert B. Rucker, Ph.D., Professor (Nutrition, Biological Chemistry)

Michael A. Satre, Ph.D., Assistant Professor
 Barbara O. Schneeman, Ph.D., Professor (Nutrition, Food Science and Technology, Internal Medicine)

Judith S. Stern, Sc.D., Professor (Nutrition, Internal Medicine)

Emeriti Faculty

Fredric W. Hill, Ph.D., Professor Emeritus
 William C. Weir, Ph.D., Professor Emeritus
 Frances J. Zeman, Ph.D., Professor Emeritus

Major Program

See the majors in Community Nutrition, Dietetics, and Nutrition Science.

Minor Program Requirements:

The Department of Nutrition offers four minor programs open to students majoring in other disciplines who wish to complement their study programs with a concentration in the area of food and nutrition.

Note: If the student's major program requires the same course in biochemistry and physiology, only one of the courses may duplicate credit toward the minor. Each program below lists replacement courses to fulfill the minimum unit requirement.

UNITS

Community Nutrition.....24
 Preparation: plan in advance to include the required course prerequisites.

Nutrition 101 or 110, plus 1119
 Nutrition 118, 192 (2).....6
 Nutrition 1204
 Physiology 1105
 Replacement courses (see note above): Nutrition 114, 116A-116B, 116AL-116BL.

UNITS

Food Service Management24-25
 Preparation: plan in advance to include the required course prerequisites.

Food Science and Technology 100A-100B, 101A-101B10
 Food Service Management 120, 120L, 121, 12211
 Food Service Management 123 or Agricultural Economics 1123-4
 Replacement courses (see note above): Nutrition 10, 101, 110, 111, 114, 116A-116B, Economics 11A-11B.

UNITS

Nutrition and Food24
 Preparation: plan in advance to include the required course prerequisites.

Nutrition 101, 1119
 Nutrition 1204
 Food Science and Technology 100A, 100B6
 Physiology 1105

Replacement courses (see note above): Nutrition 114, 116A-116B, 116AL-116BL.

UNITS

Nutrition Science.....20

Preparation: plan in advance to include the required course prerequisites.

Biological Sciences 102 and 103.....6
 Physiology 1105
 Nutrition 110, 1119
 Replacement courses (see note above): Nutrition 114, 115, 116A-116B, 117, 120, 122, 122L, 123, 124, 201, 204.

Minor Adviser. R.B. Rucker.

Graduate Study. Programs of study leading to the M.S. and Ph.D. degrees are available in Nutrition. For information on graduate study contact the graduate adviser.

Courses in Nutrition (NUT)

Lower Division Courses

10. Discoveries and Concepts in Nutrition (3) I, II, III. The Staff

Lecture—3 hours. Nutrition as a science; historical development of nutrition concepts; properties of nutrients and foods. Not open for credit to students who have taken an upper division course in nutrition. General Education credit: Nature and Environment. To receive GE credit, course 11 must be taken in a concurrent or subsequent quarter.

11. Current Topics and Controversies in Nutrition (2) I, II, III. The Staff

Discussion—1 1/2 hours; oral reports, written reports, term paper. Prerequisite: course 10 (may be taken concurrently). Assigned readings and discussion of topics of current concern and broad interest in contemporary nutrition. Coordinated with course 10. Not open for credit to students who have taken an upper division course in nutrition. General Education credit: Nature and Environment. To receive GE credit, course 10 must be taken in a concurrent or previous quarter.

20. Food and Culture: An Introduction to Culture, Diet, and Cuisine (4) II. Grivetti

Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 2, Geography 2, and course 10 recommended. Historical and contemporary overview of culture, food habits, and diet; exploration of the major themes in food habit research; minority food habits; origins and development of dietary practices. General Education credit: Nature and Environment.

***93. Public Issues in Nutrition and Food Science (1)** II. Schneeman

Seminar—1 hour. Faculty and invited guest speakers will present topics in the area of nutrition and food science which are currently subjects of public debate. Intended as an introduction to Nutrition and Food Science for students new to the campus. (P/NP grading only.) (Same course as Food Science and Technology 93.)

99. Individual Study for Undergraduates (1-5) I, II, III. The Staff

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Introduction to Nutrition and Metabolism (4) I. Lonnerdal

Lecture—4 hours. Prerequisite: Chemistry 8B; Physiology 2 or 110. Introduction to the metabolism of protein, fat, and carbohydrate; the role of vitamins and minerals; food utilization. Not open for credit to students who have taken courses 110 or 111.

110. Principles of Nutrition (5) II. Calvert (Animal Science) and Rucker (Nutrition); III. Hung (Animal Science) and Rucker (Nutrition)

Lecture—5 hours. Prerequisite: Biological Sciences 103; a course in physiology or zoology. Fundamental principles of the nutrition of man and other animals. Physiological basis of nutrient requirements for growth, maintenance and production. Physiological basis of nutritional disorders.

*Course not offered this academic year.

111. Human Nutrition (4) III. McDonald

Lecture—3 hours; discussion—1 hour. Prerequisite: course 101 or 110. Nutrition of humans; critical study of nutrient requirements at various phases of life cycle.

112. Nutritional Assessment: Dietary, Anthropometric, and Clinical Measures (2) III. Brown

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 101 or 111 (may be taken concurrently). Methods of nutritional assessment in humans to evaluate dietary intake (dietary records and recalls, food frequency lists), body composition (anthropometry, physiological methods), and clinical signs of malnutrition. Principles of validity and reliability and interpretation of results.

113. Nutritional Assessment: Biochemical Measures (2) I. The Staff (McDonald in charge)

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 111. Variety of biologic markers of human nutritional status including hematological, urine, and hair analyses of clinical importance will be demonstrated and evaluated. Emphasizes the precision, accuracy, reliability, and interpretation of the values.

114. Developmental Nutrition (4) II. Keen

Lecture—4 hours. Prerequisite: course 110 or 101; course 111. Role of nutritional factors in embryonic and postnatal development.

115. Animal Feeds and Nutrition (4) II. Brown (Animal Science)

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 8B, Animal Science 41. Analyses and evaluation of feeds, influences of production, processing and storage methods on nutritive value of feeds. Animal nutrition. Diet formulation.

116A-116B. Diet Therapy (3-3) I-II. The Staff

Lecture—3 hours. Prerequisite: course 111; Physiology 110 (or the equivalent). Biochemical and physiological bases for therapeutic diets. Problems in planning diets for normal and pathological conditions.

116AL. Practicum in Diet Therapy (2) I. The Staff

Lecture—1 hour; Laboratory—2 hours; extensive written assignments. Prerequisite: course 116A (may be taken concurrently). Planning and evaluation of therapeutic diets; procedures in patient education. Coordinated with course 116A. (Deferred grading only pending completion of 116AL-116BL sequence.)

116BL. Practicum in Diet Therapy (1) II. The Staff

Lecture—1 hour; laboratory—1 hour; extensive written assignments. Prerequisite: course 116B (may be taken concurrently); course 116AL. Planning and evaluation of therapeutic diets; procedures in patient education. Coordinated with course 116B. Continuation of course 116AL. (Deferred grading only pending completion of 116AL-116BL sequence.)

117. Experimental Nutrition (5) I. Clifford

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 111; Biological Sciences 103; a laboratory course in nutrition or biochemistry. Methods of assessing nutritional status. Application of chemical, microbiological, chromatographic and enzymatic techniques to current problems in nutrition.

118. Community Nutrition (4) II. Dewey

Lecture—4 hours. Prerequisite: course 101 or 111, and 116A. Nutrition problems in contemporary communities and of selected target groups in the United States and in developing countries. Nutrition programs and policy, principles of nutrition education.

120. Food Habits and their Nutritional Implications (4) I. Grivetti

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division or graduate standing; upper division course in nutrition or Biological Sciences 103; course 20 recommended. Advanced themes exploring food habits and their nutritional implications; pica; toxicants naturally occurring in food; ethnic diet; food systems; dietary codes; overview and case histories.

122. Ruminant Nutrition and Digestive Physiology (3) III. Fadel and Macy (Animal Science)

Lecture—3 hours. Prerequisite: Physiology 110; Biological Sciences 102, 103; Microbiology 2 recommended. Study of nutrient utilization as influenced by the unique aspects of digestion and fermentation in the ruminant.

***122L. Ruminant Nutrition Laboratory (2) III.** Macy (Animal Science)

Laboratory—6 hours. Prerequisite: course 122 (concurrently). Students will conduct experiments in small groups and attend demonstrations on topics peculiar to ruminant digestive physiology and nutrition. The laboratory will deal with topics developed in lectures.

123. Companion and Captive Animal Nutrition (4) III. Klasing

Lecture—3 hours; discussion/laboratory—3 hours. Prerequisite: course 110; Biological Sciences 102 and 103. Comparative nutrition of non-ruminant vertebrate animals; including laboratory and companion animals, primates and wildlife. Relation of nutrition to metabolic adaptations and physiological state. Discussion/laboratory exercises leading to written group reports on establishment of nutritional requirements and formulating complete diets.

124. Nutrition and Feeding of Finfishes and Shellfishes (3) III. Hung and Conklin (Animal Science)

Lecture—3 hours. Prerequisite: course 110 or 115. Application of principles of nutrition to feeding of finfishes and shellfishes; feeding habits, gastrointestinal anatomy, digestive physiology, aquatic environment, nutrient requirements, diet formulation and quality control, and feeding practices of commercially cultured fishes.

129. Journalistic Practicum in Nutrition (2) III. Stern

Discussion—2 hours. Prerequisite: course 111; a course in written or oral expression or consent of instructor. Critical analysis and discussion of current, controversial issues in nutrition; the use of journalistic techniques to interpret scientific findings for the lay public. Students will be required to write several articles for campus media. Course may be repeated once for credit. Offered in alternate years.

130. Experiments in Nutrition: Design and Execution (2) I, II, III. The Staff (Keen in charge)

Laboratory—6 hours. Prerequisite: consent of instructor required; course 101, 110, 111, or 114 recommended. Experiments in current nutritional problems, Discussion of experimental design. Students must choose a project, and, independently or in groups of 2-3, design a protocol, do the project and report their findings. May be repeated for credit with consent of instructor.

190. Proseminar in Nutrition (1) I, II, III. The Staff Seminar—1 hour. Prerequisite: senior standing; course 111. Discussion of human nutrition problems. Each term will involve a different emphasis among experimental, clinical, and dietetic problems of community, national and international scope. May be repeated twice for credit with consent of instructor.

190C. Nutrition Research Conference (1) I, II, III. The Staff (Keen in charge)

Discussion—1 hour. Prerequisite: upper division standing in Nutrition or related biological science; consent of instructor. Introduction to research findings and methods in nutrition. Presentation and discussion of research by faculty and students. May be repeated for credit. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff

Internship—3-36 hours. Prerequisite: one upper division course in nutrition and consent of instructor. Work experience on or off campus in practical application of nutrition, supervised by a faculty member. (P/NP grading only.)

197T. Tutoring in Nutrition (1-2) I, II, III. The Staff Discussion/laboratory—3 or 6 hours. Prerequisite: Nutrition Science, Dietetics, Community Nutrition or related major. Completion of course 101 or 110 with a grade of B or better. Tutoring of students in nutrition courses, assistance with discussion groups or laboratory sections, weekly conference with instructor in charge of course: written evaluations. May be repeated if tutoring a different course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Keen in charge) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Keen in charge) (P/NP grading only.)

Graduate Courses**201. Vitamin Metabolism (2) II.** Rucker

Lecture—2 hours. Prerequisite: upper division nutrition or biochemistry course. Review of studies and relationships involving the metabolic functions of vitamins. Comparative nutritional aspects and the metabolism and chemistry of vitamins and vitamin-like compounds emphasized.

202. Advanced Nutritional Energetics (2) I. Baldwin

Lecture—2 hours. Prerequisite: course 110, Biological Sciences 103, Physiology 110 or the equivalent. History of nutritional energetics. Evaluation of energy transformations associated with food utilization. Energy expenditures at cellular, tissue, and animal levels as affected by diet and physiological state. Current and future feeding systems.

203. Advanced Protein and Amino Acid Nutrition (2) III. The Staff (Rogers, Molecular Biosciences, in charge)

Lecture—2 hours. Prerequisite: course 110, Biological Sciences 103, Physiology 110 or the equivalent. Nutritional significance of protein and amino acids, including studies of the influence of dietary protein on digestion, absorption, metabolism, resistance to disease, and food intake. Study of dietary requirements and interrelationships among amino acids.

204. Mineral Metabolism (2) III. Lonnerdal, Keen

Lecture—2 hours. Prerequisite: upper division nutrition or biochemistry course. Studies of metabolic functions and nutritional interrelationships involving minerals.

***216. Advanced Diet Therapy (3) III.** The Staff

Lecture—3 hours. Prerequisite: course 116A-116B. Nutrition and disease interrelationships at cellular, tissue, and whole body levels with emphasis on human disease. Critical evaluation of methodology in the study of nutrition in disease states.

***218. Advanced Field Work in Community Nutrition (2-12) I, II, III,** extra session summer. The Staff Discussion—1 hour; field work. Prerequisite: courses 118, 119; graduate standing; consent of instructor. Directed experience in community nutrition. Organization and implementation of nutrition programs.

219A. International Nutrition (3) II. Brown, Dewey, Pollitt (Pediatrics)

Lecture/discussion—3 hours. Prerequisite: upper division course in nutrition or consent of instructor. Epidemiology, etiology, and consequences of undernutrition in developing countries. Offered in alternate years.

219B. International Nutrition (3) III. Brown, Dewey, Pollitt (Pediatrics)

Lecture/discussion—3 hours. Prerequisite: upper division course in nutrition or consent of instructor. Nutrition policies and programs in developing countries. Offered in alternate years.

252. Nutrition and Development (3) II. Keen

Lecture—3 hours. Prerequisite: courses 201, 202, 203. Relationship of nutrition to prenatal and early postnatal development. Offered in alternate years.

***253. Control of Food Intake (3) III.** Stern (Nutrition), Gietzen (Physiological Sciences), and staff

Lecture—2 hours; discussion—1 hour; 2 or 3 laboratory demonstrations per quarter. Prerequisite: course 201 or 202 or consent of instructor. Comprehensive study of the biochemical, nutritional, behavioral, and physiological mechanisms controlling food intake. Subject matter will be approached through lectures, laboratory demonstration and discussions where students and staff will critically evaluate the literature. Offered in alternate years.

***254. Applications of Systems Analysis in Nutrition (3) I.** Baldwin (Animal Science)

Lecture—2 hours; discussion—1 hour. Prerequisite: course 202, Physiological Sciences 205A-205B or the equivalent. Quantitative aspects of digestion and metabolism; principles of systems analysis. Evolution of models of energy metabolism as applied in current feeding systems. Critical evaluations of mechanistic

models used analytically in support of nutritional research. Offered in alternate years.

255. Nutritional Toxicology (3) I. Brown
Lecture/discussion—3 hours. Prerequisite: course 110 or the equivalent, courses 201 and 204; Physiological Sciences 205B recommended. Examines naturally occurring toxicants in human food and animal feeds. Toxic nutrients, anti-nutrients, secondary plant compounds and mycotoxin metabolism will be emphasized.

256. Nutritional and Hormonal Control of Animal Metabolic Function (3) III. Baldwin (Animal Science)
Lecture—3 hours. Prerequisite: courses 201, 202, 203; Physiological Sciences 205A-205B. Significance and interpretation of enzyme, metabolite, in vitro and in vivo isotope tracer, energetic and other data. Critical evaluation of methodology and limitations in evaluation of animal metabolism. Diet-hormone interactions in carbohydrate, amino acid, and lipid metabolism will be discussed. Offered in alternate years.

257. Selected Topics in Nutritional and Hormonal Control of Nitrogen Metabolism (2) I. Klasing (Avian Sciences), Calvert (Animal Science)
Lecture—2 hours. Prerequisite: courses 201 through 204; Physiological Sciences 205A-205B or the equivalent. Quantitative and qualitative aspects of nitrogen metabolism; critical evaluation of dietary intake, hormones and diet-hormone interactions which affect nitrogen metabolism, including protein synthesis-degradation, amino acid synthesis-catabolism, nitrogen transport-excretion, depending on current literature. Offered in alternate years.

***258. Field Research Methods in International Nutrition** (3) II. Brown, Dewey, Pollitt (Pediatrics)
Lecture/discussion—3 hours. Prerequisite: graduate standing or consent of instructor. Issues and problems related to implementation of nutrition field research in less-developed countries, including ethics; relationships with local governments, communities, and scientists; data collection techniques and quality assurance; field logistics; research budgets; and other administrative and personal issues. Offered in alternate years.

290. Beginning Nutrition Seminar (1) I, II. The Staff
Seminar—2 hours. Prerequisite: first-year graduate standing. Discussion and critical evaluation of topics in nutrition with emphasis on literature review and evaluation in this field.

290C. Research Conference (1) I, II, III. The Staff (Keen in charge)
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Major professors lead research discussions with their graduate students. Research papers are reviewed and project proposals presented and evaluated. Format will combine seminar and discussion style. (S/U grading only.)

291. Advanced Nutrition Seminar (1) I, II, III. The Staff (Keen in charge)
Seminar—1 hour. Prerequisite: second-year graduate standing. Discussion and critical evaluation of advanced topics in nutrition research. (S/U grading only.)

297T. Supervised Teaching in Nutrition (1-3) I, II, III. The Staff (Keen in charge)
Teaching under faculty supervision—3-9 hours. Prerequisite: graduate status in nutrition or consent of instructor. Practical experience in teaching nutrition at the university level; curriculum design and evaluation; preparation and presentation of material. Assistance in laboratories, discussion sections, and evaluation of student work. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Keen in charge)

299. Research (1-12) I, II, III. The Staff (Keen in charge)
(S/U grading only.)

Professional Course

***380. Supervised Teaching in Dietetics** (2-12) I, II, III, extra-session summer. The Staff
Laboratory—6-36 hours. Prerequisite: graduate standing in M.S. program in Nutrition with emphasis in dietetics; consent of instructor. Directed teaching in approved dietetic internships or coordinated program in dietetics. May be repeated for a total of 12 units; 3 units may be counted toward degree credit.

Nutrition (A Graduate Group)

Q.R. Rogers, Ph.D., Chairperson of the Group
Group Office, 3135 Meyer Hall (916-752-4630)

Faculty. Faculty are drawn from the Colleges of Agricultural and Environmental Sciences, and of Letters and Science, and the Schools of Medicine and of Veterinary Medicine.

Graduate Study. The Graduate Group in Nutrition offers programs of study and research leading to the M.S. and Ph.D. degrees. Research activities in nutrition include work with humans and with laboratory, domestic, and wild animals. Areas of specialization include: the effect of diet on energetics and intermediary metabolism; studies on enzymatic adaptation, community nutrition, ruminant nutrition, amino-acid requirements and utilization; nutrient balance and food intake regulation; biological antioxidants; food toxicants; mineral and vitamin nutrition; various anomalies of pre- and postnatal development; parenteral nutrition; the application of biomathematics to nutritional analyses; human and animal dietetics; and international nutrition. For detailed information regarding these programs, address the chairperson of the group.

Graduate Advisers. Consult the Nutrition Graduate Group Office.

Nutrition Science

(College of Agricultural and Environmental Sciences)

The Major Program

The study of nutrition encompasses all aspects of the collection, preparation, and consumption of food. Also important in the study of nutrition are the biochemical reactions that take place within the body's cells to utilize these nutrients. This is the level at which the nutrition science major explores the general subject of nutrition.

The Program. While students may elect to take courses concerning the social, psychological, economic, or cultural aspects of nutrition, the bulk of the course work making up the major consists of courses in the sciences. Nutrition as it is taught on the Davis campus is a biological science and requires a complete background in chemistry and biology, along with physics and calculus. These courses are generally completed during the first two years, and along with biochemistry, must be completed before most nutrition classes can be taken. Nutrition science students go on to study nutrition in depth during their junior and senior years.

Career Alternatives. The nutrition science major is excellent preparation for technical work in nutrition in animal, food, and pharmaceutical industries. It also provides a strong background for technical writing or health education. Students who wish to continue their studies are well prepared for professional study in nutrition, dietetics, medicine, and other health sciences.

B.S. Major Requirements:

(For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. Courses shown without parentheses are required.)

UNITS

English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	59-62
Biological sciences (Biological Sciences 1A, 1B, 1C)	15
Chemistry (2A-2B-2C; and 8A-8B or 118A-118B or 128A-128B and 129A)	21-23
Computer science (Computer Science Engineering 10 or 15 or Agricultural Systems and Environment 21)	3-4
Mathematics (Mathematics 16A-16B)	6
Physics (Physics 1A-1B)	6
Statistics (Statistics 13 or Agricultural Systems and Environment 120)	4
Breadth/General Education	24
Satisfaction of General Education requirement plus additional course work in social sciences and humanities	
Depth Subject Matter	26-28
Biochemistry (Biological Sciences 102, 103)	6
Nutrition 110, 111, 117	14
Nutrition courses selected from 112, 113, 114, 115, 116A, 116B, 122, 122L, 123, 190, 190C, 198, and 199	6-8
Restricted Electives	42
Biochemistry laboratory (Molecular and Cellular Biology 120L)	6
Food science (upper division courses)	6
Physiology with laboratory (Physiology 110, 110L, plus an additional physiology course)	10
Additional nutrition or related biological and physical sciences	20
Unrestricted Electives	16-22
Total Units for the Degree	180

Major Adviser. B. L. Lonnerdal.

Advising Center for the major is located in 1151 Meyer Hall (916-752-2512).

Graduate Study. The Department of Nutrition offers programs of study and research leading to the M.S. and Ph.D. degrees in Nutrition. For information on graduate study contact the graduate adviser. See also the Graduate Studies section in this catalog.

Graduate Adviser. See *Class Schedule and Room Directory*.

†To fulfill the academic requirements for an internship in Dietetics, choose the following courses from the categories in which they appear above: English 1 or 3, Psychology 1, Rhetoric and Communication 1, Sociology 1 or 3 or Anthropology 2, Economics 1A or 1B, Food Science and Technology 100A, 100B, 101A, 101B, Nutrition 110, 111, 113, 116A, 116B, 116AL-BL, 118, 190. The following courses must be added: Agricultural Economics 112; Food Service Management 120, 120L, 121, 122, 123; Applied Behavioral Sciences 173 or Education 110. Students intending to apply for admission to a dietetic internship should contact the Advising Office no later than the first quarter of the junior year for information on procedures.

Obstetrics and Gynecology

See Medicine, School of

Ophthalmology

See Medicine, School of

Organizational Studies

See Sociology

Orientation

(College of Agricultural and Environmental Sciences)

Course in Orientation (ORI)

Questions pertaining to the following course should be directed to the instructor or to the Biochemistry and Biophysics Department, 149 Briggs Hall.

Lower Division Course

***1. Orientation** (no credit) I, II, III. Chaykin (Biochemistry and Biophysics)
Discussion. Exploration of the philosophy, purposes, significance, expectations and mechanisms of university education. (P/NP grading only.)

Orthopaedic Surgery

See Medicine, School of

Otolaryngology

See Medicine, School of

Pathology

See Pathology (Medicine, School of); and Pathology, Microbiology and Immunology (Veterinary Medicine), below

Pathology, Microbiology, and Immunology

(School of Veterinary Medicine)

N. James MacLachlan, B.V.Sc., Ph.D., Chairperson of the Department
Department Office, 1126 Haring Hall (916-752-1385)

Faculty

Mark L. Anderson, D.V.M., Ph.D., Associate Professor of Clinical Diagnostic Pathology (*California Veterinary Diagnostic Laboratory*)
Alex A. Ardans, D.V.M., M.S., Professor (*Medicine and Epidemiology*)
Bradd C. Barr, D.V.M., Ph.D., Associate Professor of Clinical Diagnostic Pathology (*California Veterinary Diagnostic Laboratory*)
Arthur A. Bickford, V.M.D., Ph.D., Professor of Clinical Diagnostic Pathology (*California Veterinary Diagnostic Laboratory*)
Patricia C. Blanchard, D.V.M., Ph.D., Assistant Professor of Clinical Diagnostic Pathology (*California Veterinary Diagnostic Laboratory*)
Walter M. Boyce, D.V.M., Ph.D., Associate Professor
Pat A. Conrad, D.V.M., Ph.D., Associate Professor
George Cooper, D.V.M., M.S., Assistant Professor of Clinical Diagnostic Microbiology (*California Veterinary Diagnostic Laboratory*)
James S. Cullor, D.V.M., Ph.D., Associate Professor
Brad DeBey, D.V.M., Ph.D., Associate Professor of Clinical Diagnostic Pathology (*California Veterinary Diagnostic Laboratory*)
David A. Ferrick, Ph.D., Assistant Professor
Laurel J. Gershwin, D.V.M., Ph.D., Professor
Sharon K. Hietala, Ph.D., Assistant Professor of Clinical Diagnostic Immunology (*California Veterinary Diagnostic Laboratory*)
Robert J. Higgins, B.V.Sc., M.Sc., Ph.D., Associate Professor
Dwight C. Hirsh, D.V.M., Ph.D., Professor
Nemi C. Jain, M.V.Sc., Ph.D., Professor
Bill Johnson, D.V.M., Ph.D., Assistant Professor of Clinical Diagnostic Pathology (*California Veterinary Diagnostic Laboratory*)
Kenneth M. Lam, Ph.D., Professor
Rance B. LeFebvre, Ph.D., Associate Professor
Linda J. Lowenstine, D.V.M., Ph.D., Professor
N. James MacLachlan, B.V.Sc., Ph.D., Professor
Christopher J. Miller, D.V.M., Ph.D., Assistant Adjunct Professor (*Pathology, California Primate Research Center*)
F. Charles Mohr, D.V.M., Ph.D., Assistant Professor
Peter F. Moore, B.V.Sc., Ph.D., Associate Professor
Frederick A. Murphy, D.V.M., Ph.D., Dean
Harvey J. Olander, D.V.M., Ph.D., Professor
Bennie I. Osburn, D.V.M., Ph.D., Professor
Roy R. Pool, Jr., D.V.M., Professor
Deryck H. Read, B.V.Sc., Ph.D., Assistant Professor of Clinical Diagnostic Pathology (*California Veterinary Diagnostic Laboratory*)
H.L. Shivaprasad, M.S., B.V.Sc., Ph.D., Assistant Professor of Clinical Diagnostic Pathology (*California Veterinary Diagnostic Laboratory*)
Anthony A. Stannard, D.V.M., Ph.D., Professor (*Medicine and Epidemiology; Pathology, Microbiology and Immunology*)
Jeffrey L. Stott, Ph.D., Associate Professor
Richard L. Walker, D.V.M., M.P.V.M., Ph.D., Associate Professor (*California Veterinary Diagnostic Laboratory*)
Dennis W. Wilson, D.V.M., M.S., Ph.D., Associate Professor
Tilahun Yilma, D.V.M., Ph.D., Professor
Yuan Chung Zee, D.V.M., Ph.D., Professor
Joseph G. Zinkl, D.V.M., Ph.D., Professor

Part-Time Clinical Faculty

Robert M. DuFort, D.V.M., Assistant Clinical Professor

Sonja M. Shelly, D.V.M., Assistant Clinical Professor
John W. Switzer, D.V.M., Associate Clinical Professor

Emeriti Faculty

Norman F. Baker, D.V.M., Ph.D., Professor Emeritus
Ernst L. Biberstein, D.V.M., Ph.D., Professor Emeritus
Donald R. Cordy, D.V.M., Ph.D., Professor Emeritus
Donald L. Dungworth, B.V.Sc., Ph.D., Professor Emeritus
Bernard F. Feldman, D.V.M., Ph.D., Professor Emeritus
Donald E. Jasper, D.V.M., Ph.D., Professor Emeritus
Jiro K. Kaneko, D.V.M., Ph.D., D.V.Sc. (hc), Professor Emeritus
Peter C. Kennedy, D.V.M., Ph.D., Professor Emeritus
Jack E. Moulton, D.V.M., Ph.D., Professor Emeritus
John W. Osebold, D.V.M., Ph.D., Professor Emeritus
Ming Ming Wong, Ph.D., Professor Emeritus

Courses in Pathology, Microbiology, and Immunology (PMI)

Upper Division Courses

101. Comparative Hematology (2) III. Kaneko, Jain, Zinkl

Lecture—2 hours. Prerequisite: Biological Sciences 1A, Physiology 110, Biochemistry 101A-101B or Physiological Sciences 101A-101B or consent of instructor. Principles, interpretation, and applications of clinical hematology; comparative blood cellular morphology and function.

101L. Comparative Hematology Laboratory (2) III. Kaneko, Zinkl, Jain
Laboratory—6 hours. Prerequisite: course 101 (should be taken concurrently) and consent of instructor. Introduction to laboratory methods and procedures of clinical hematology. Limited enrollment.

102. Clinical Biochemistry (3) II. Kaneko
Lecture—3 hours. Prerequisite: Physiology 112, 113; Physiological Sciences 101A-101B or Biochemistry and Biophysics 101A-101B or consent of instructor. Principles of biochemistry as related to alterations in the biochemical constituents of blood, urine and other body fluids.

126. Fundamentals of Immunology (3) I. Ferrick, Gershwin, Stott
Lecture—3 hours alternate weeks with lecture—2 hours and discussion—1 hour. Prerequisite: Biochemistry 101A or the equivalent. Immune response and defenses of host against infection: antibodies, antigens, antibody-antigen interactions, regulation and manipulation of the immune response, hypersensitivity mechanisms and their relationships to disease processes. Clinical applications of immune phenomena emphasized.

126L. Immunology Laboratory (2) II. Ferrick
Laboratory—6 hours. Prerequisite: course 126. Laboratory procedures in immunology. The immune response to antigens, antigen-antibody interactions, hypersensitivity mechanisms.

127. Medical Bacteria and Fungi (5) III. LeFebvre
Lecture—3 hours; laboratory—6 hours. Prerequisite: general microbiology (Microbiology 20 or 102); basic immunology (Pathology, Microbiology and Immunology 126 or Medical Microbiology 107). An introduction to the bacterial and mycotic pathogens of man and animals, with emphasis on pathogenic mechanisms and ecologic aspects of infectious disease. Limited enrollment.

128. Biology of Animal Viruses (3) I. Zee
Lecture—3 hours. Prerequisite: Biochemistry 101A or the equivalent. Fundamental physical and chemical properties of animal viruses; methods of propagation, purification and assay. Mechanisms of viral replication and pathogenesis of viral infections in man and animals. Immunity to virus diseases and oncogenic properties of animal viruses.

***132. Introduction to Parasitology** (5) III. Conrad
Lecture—3 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1B. The nomenclature of human and animal parasites, their general morphology, life cycles, epidemiology, diagnostic techniques, and

host-parasite relationships. Individual laboratory studies supplemented with demonstrations.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Gershwin in charge)
(P/NP grading only.)

Graduate Courses

204. Normal and Abnormal Bone Marrow

Cytology (1) III. Zinkl
Lecture-laboratory—2 hours. Prerequisite: Veterinary Medicine 435 or course 101. Normal maturation of hematopoietic cells followed by a study of the cytology of blood and bone marrow in selected diseases of domestic animals including infections, anemias, myeloproliferative disorders and leukemias.

205. Physiology and Pathology of Leukocytes (2) III. Jain

Lecture—2 hours. Prerequisite: course 101, Biochemistry 101A-101B, or consent of instructor. Metabolism, ultrastructure, kinetics, homeostasis, cytochemistry, and functions of different leukocytes; physiological, functional, histochemical, and morphological changes in leukocytes in diseases; their role in inflammatory and immunologic processes. Offered in alternate years.

***206. Immunohematology (2) III.** Jain, MacKenzie (Medicine)

Lecture—2 hours. Prerequisite: course 101, Veterinary Microbiology 126, or consent of instructor. Immunologic aspects of hematology; blood cell antigens and antibodies; autoimmune hematologic diseases; reactions to blood transfusions; transplantation mechanisms. Offered in alternate years.

216. Immunodiagnostic Techniques (3) II. Lam, Cullor

Lecture—3 hours. Prerequisite: enrollment in MPVM program or consent of instructor. Consideration of immunodiagnostic techniques for screening of animal populations for disease. Emphasis on rapid, simple, and inexpensive procedures for mass screening.

216L. Immunodiagnostic Techniques Laboratory (2) II. Lam

Discussion—1 hour; laboratory—2 hours. Prerequisite: course 216 (may be taken concurrently) or consent of instructor. Application and interpretation of serologic techniques for diagnosis of animal diseases. (S/U grading only.) Limited enrollment.

219. Mycoplasma as Agents of Disease (2) III. Lam
Lecture—2 hours. Prerequisite: Veterinary Microbiology and Immunology 127 or the equivalent or consent of instructor. Offered in alternate years.

***228. Molecular Biology of Animal Viruses (3) II.** The Staff

Lecture—3 hours. Prerequisite: course 128 or Microbiology 162 or the equivalent. Current status of molecular biology of the major groups of animal viruses. Topics of major emphasis include: virus genome structure, strategy of genome replication and transcription, and regulation of genome expression.

270. Advanced Immunology (3) II. Stott

Lecture—3 hours. Prerequisite: course 126 or Veterinary Medicine 450 or consent of instructor. Immunoglobulin structure and function, antigenic determinants, complement. Biology of lymphocytes; cell-mediated immune reactions, immunogenetics, hypersensitivity. Pathogenetic mechanisms in immunological diseases, immunological unresponsiveness, cancer immunology. Dynamics of infection and resistance. Methods in immunochemistry and immunobiology. Offered in alternate years.

281. Foreign Animal Diseases (3) III. Olander

Lecture—3 hours. Prerequisite: course 210, and Veterinary Medicine 452, and 451 or 459. For students interested in research and teaching in tropical veterinary medicine. The diseases studied are the most important ones that currently ravage third-world countries, particularly Africa and Latin America. Offered in alternate years.

282. Tumor Pathology (3) II. The Staff

Lecture—3 hours. Prerequisite: graduate standing or final-year veterinary student and consent of instructor. The histogenesis, incidence, geographical distribution, etiology, transmission, immunity, host response, gross and microscopic structure, and metastasis of the neoplasms of domestic animals. Offered in alternate years.

283. Comparative Avian Anatomy and Pathology (1-3) I. Lowenstine

Lecture—3 hours. Prerequisite: anatomy section—upper division undergraduates, graduates, and veterinary students; pathology section—third- and fourth-year veterinary students and graduate students. Ten lectures outline gross/microscopic anatomy of a wide range of avian species as appropriate for students interested in avian biology. Twenty lectures encompass comparative aspects of avian pathobiology and disease manifestations for students interested in avian diseases. Offered in alternate years.

284. Pathogenesis of Infectious Disease (2) III. Cullor

Lecture—2 hours. Prerequisite: upper division or graduate standing in biology or the medical sciences and introductory courses in microbiology, immunology, hematology, or consent of instructor. Features of pathogenicity and host defense mechanisms common to infection with bacteria, viruses, fungi, and protozoa are emphasized, as well as the important species differences. Perinatal immune responses of dam and offspring are also covered. Offered in alternate years.

285. Cellular Basis of Disease (3) II. Mohr, Wu

Lecture—3 hours. Prerequisite: Biochemistry 101A, 101B, Biological Sciences 104, and either Veterinary Medicine 452 or Medical Pathology 210. The disciplines of cell biology, biochemistry and molecular biology will be applied to the understanding of the basic nature of disease. Covers cellular injury and mechanisms of adaptation, host-defense and vascular responses, and cellular transformation. Offered in alternate years.

***286A-286B-286C. Selected Topics in Advanced Special Pathology (2-11) I, II, III.** The Staff

Lecture—variable. Prerequisite: graduate standing, DVM degree, or final-year veterinary student. Varied topics. See department for details. Offered in alternate years. (Deferred grading only, pending completion of sequence.)

287. Comparative Pathology of Laboratory Animals (3) III. Lowenstine

Lecture—3 hours. Prerequisite: graduate standing, DVM degree, or final-year veterinary student; consent of instructor in charge. The pathology of diseases of animals commonly kept in laboratory settings including cold-blooded vertebrates as well as rodents, lagomorphs, and non-human primates. Emphases will be recognition of lesions and understanding of pathogenesis. Offered in alternate years.

290. Seminar in Veterinary Pathology (1) I, II, III. The Staff

Seminar—1 hour. (S/U grading only.)

290A. Current Topics in Avian Medicine (1) I, II, III. Lam, Wakenell

Seminar—1 hour. Prerequisite: consent of instructor. Topics from the current literature in avian medicine will be assigned to students for discussion and interpretation.

291A. Seminar in Immunology (1) I, II, III. Gershwin
Seminar—1 hour. A discussion of the current topics in immunology. (S/U grading only.)

291B. Histopathology Conference (1) I, II, III. The Staff (Wilson in charge)

Discussion—1 hour. Prerequisite: graduate standing or final-year veterinary student; consent of instructor. Discussion of selected cases based on records and slides. Defense of diagnoses. (S/U grading only.)

292A. Seminar in Animal Virology (1) I, II, III. Yilma, Zee

Seminar—1 hour. A discussion of the current topics in animal virology. (S/U grading only.) (Same course as Microbiology 296.)

292B. Surgical Pathology Conference (1) I, II, III.

The Staff (Pool in charge)
Discussion—1 hour. Prerequisite: graduate standing or final-year veterinary student; consent of instructor. Diagnosis and discussion of current surgical pathology cases based on clinical records and microscopic study. (S/U grading only.)

293A. Seminar in Infectious Diseases (1) I, II, III. Hirsh

Seminar—1 hour. Discussion of current topics and cases of infectious diseases. (S/U grading only.)

293B. Necropsy and Surgical Pathology (1-4) I, II, III. The Staff (Olander in charge)

Discussion—1 hour; laboratory—32 hours. Prerequisite: graduate standing; consent of instructor. Responsible diagnostic casework. Performance of necropsies, slide reading, and case reporting. (S/U grading only.)

294A. Comparative Pathology Conference (1) I, II, III. Lowenstine

Discussion—1 hour. Prerequisite: graduate standing or final-year veterinary student; consent of instructor. Discussion of selected topics in comparative pathology based on currently available case materials from fish, laboratory animals, zoo and wild animals and non-human primates. Given jointly by the Departments of Pathology in the Medical and Veterinary Schools and the California Primate Research Center. (S/U grading only.)

294B. Conservation Biology and Veterinary Medicine (1) II. Boyce

Seminar—1 hour. Discussion of current topics in conservation biology as they relate to veterinary medicine; the emphasis is on wildlife. (S/U grading only.)

296. Microbiological Diagnosis (2-5) I, II, III. Gershwin, Hirsh

Discussion—1 hour; laboratory—5-14 hours. Prerequisite: laboratory course in veterinary or medical microbiology or the equivalent; course 293 (concurrently); consent of Chief of Microbiology, VM Teaching Hospital. Laboratory diagnosis of infectious diseases involving case work at the VM Teaching Hospital. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff

Group Study of advanced topics in pathology. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (S/U grading only.)

Professional Courses

418. Diseases of Free-Living Wildlife (2) III. Boyce
Discussion—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Lectures on the ecology and epidemiology of disease in free-living wild animals including medical management of free-living populations.

418L. Diseases of Free-Living Wildlife Laboratory (3) III. Boyce

Lecture—1 hour; laboratory—90 hours total. Prerequisite: third-year standing in the School of Veterinary Medicine and course 418. Field course designed to develop problem solving skills for field and laboratory assessments of wildlife health and related environment; learn and perform technical aspects of wildlife restraint; develop skills necessary to approach field studies.

Pediatrics

See Medicine, School of

Pharmacology and Toxicology

See Medical Pharmacology and Toxicology (under Medicine, School of); Molecular Biosciences (Veterinary Medicine); and Pharmacology and Toxicology (A Graduate Group), below

Pharmacology and Toxicology (A Graduate Group)

David E. Hinton, Ph.D., Chairperson of the Group
Group Office, 4111 Meyer Hall (Department of Environmental Toxicology, 916-752-4516)

Faculty. The 50 faculty in the graduate group are from more than 20 academic departments and organized research units within the College of Agricultural and Environmental Sciences, the School of Medicine and the School of Veterinary Medicine.

Graduate Study. The program of study and research leading to the Ph.D. degree emphasizes an interdisciplinary approach to graduate student training (students are admitted for the M.S. degree only under unusual and limited circumstances). Areas of research specialization are broad in scope and include clinical pharmacology and toxicology, environmental and ecotoxicology, genetic and development pharmacology and toxicology, neuropharmacology and toxicology, and respiratory pharmacology and toxicology. Career opportunities include teaching in professional schools and hospitals, laboratory research in academia, government, industry, environmental control, and agricultural and drug regulatory agencies. For detailed information on the program, contact the Group Office, appropriate graduate adviser, or the group chairperson.

Graduate Advisers. C.G. Plopper (*Veterinary Anatomy and Cell Biology*), A.J. Hance (*Medical Pharmacology and Toxicology*), J.A. Last (*Pulmonary Medicine*), B.W. Wilson (*Environmental Toxicology*).

Courses in Pharmacology and Toxicology (PTX)

Graduate Courses

201. Principles of Pharmacology and Toxicology I (5) I. Miller (Environmental Toxicology)

Lecture—5 hours. Prerequisite: Biological Sciences 103, Physiology 110. Basic concepts underlying metabolic fate of xenobiotics, receptor and cell biology, and chemotherapy for cancer and infectious disease. Specific topics include fate processes, disposition kinetics, dose-response relationships, cellular toxicity and oncogenes.

202. Principles of Pharmacology and Toxicology II (5) II. Buckpitt (Veterinary Pharmacology and Toxicology)

Lecture—5 hours. Prerequisite: satisfactory completion of course 201. Mechanisms of action, pharmacologic and toxic effects, and pathologic changes produced by drugs and other chemical substances on various body systems and their associated organs.

203. Principles of Pharmacology and Toxicology III (5) III. Joy (Veterinary Pharmacology and Toxicology)
Lecture—3 hours; discussion—1 hour; tutorial—1-3 hours. Prerequisite: courses 201 and 202. Mechanisms of action, pharmacology, toxic effects, and pathologic changes produced by drugs and other chemical substances on various body systems and their associated organs. Ecotoxicity, risk assessment and epidemiology.

230. Advanced Topics in Pharmacology and Toxicology (1-3) I, II, III. The Staff
Lecture/discussion/seminar—1 hour each (course format can vary at option of instructor). Prerequisite: course 201 and consent of instructor. In-depth coverage of selected topics for graduate students in Pharmacology-Toxicology and related disciplines. Topics determined by instructor in charge for each quarter.

290. Seminar (1) I, II, III. The Staff
Current topics in pharmacology and toxicology. (S/U grading only.)

Philosophy

(College of Letters and Science)

Michael V. Wedin, Ph.D., Chairperson of the Department

Department Office, Social Sciences and Humanities Building (916-752-0607)

Faculty

Philip M. Clark, III, Ph.D., Assistant Professor
David I. Copp, Ph.D., Professor
Joel I. Friedman, Ph.D., Professor
James R. Grisesmer, Ph.D., Associate Professor
Michael Jubien, Ph.D., Associate Professor
Jeffrey King, Ph.D., Associate Professor
John F. Malcolm, Ph.D., Professor
George J. Matthey II, Ph.D., Lecturer
Paul Teller, Ph.D., Professor
Michael V. Wedin, Ph.D., Professor
Richard A. Wollheim, M.A., Visiting Professor

Emeriti Faculty

Ronald A. Arbini, Ph.D., Professor Emeritus
William H. Bossart, Ph.D., Professor Emeritus
Neal W. Gilbert, Ph.D., Professor Emeritus
Marjorie Grene, Ph.D., Professor Emeritus

The Major Program

Philosophy is the study of conceptual problems that pertain to the nature of knowledge, reality, and human conduct.

The Program. The Department of Philosophy offers courses in such areas as the theory of knowledge, metaphysics, logic, ethics, and aesthetics. In addition, upper division course work is given in the fields of philosophy of mathematics, moral and political philosophy, philosophy of religion, philosophy of the natural and social sciences, and philosophy of language.

Philosophy is also a subject in which the problems discussed recur, or have important roots in past discussion. The history of philosophy is thus important not only as part of the heritage of educated persons, but also because it is relevant to contemporary issues. The department therefore places great emphasis on the history of philosophy, and provides courses in the major figures and traditions of western philosophy, as well as in the influential contemporary schools of the continental and analytic varieties.

Career Alternatives. Many students major in philosophy with a plan to do graduate work and teach philosophy, or as background training for other professions. Philosophy majors have done extremely well in law schools and medical schools, for example. Also, many philosophy majors go on to advanced work in other academic areas in the humanities and social sciences; graduates may also go into such fields as government, the ministry, publishing, social work, and even business.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	16
Philosophy 12, 21, 22, 23	16
Depth Subject Matter	36
Upper division units in Philosophy selected with approval from the major adviser...36	
Total Units for the Major	52

Major Advisers. G.J. Matthey, J.F. Malcolm.

Minor Program Requirements:

Students wishing to minor in Philosophy may choose a general minor or a minor specializing in logic. There are no specific courses required for the general minor, so students may create a program to suit their own interests, subject to the approval of the minor adviser. The range of choice in the logic specialization is limited to the courses listed.

	UNITS
Philosophy—General	20
20 upper division units in philosophy, chosen in consultation with the minor adviser. At most, 4 units may be lower division if the student has taken two lower division philosophy courses, one of which is drawn from the following: Philosophy 12, 21, 22, 23.	

Philosophy—Logic	20
Philosophy 12 or Mathematics 108 ...4	
Philosophy 112	4
Select units from Philosophy 113, 131, 132, 133, 134, 135	12

Minor Advisers. G.J. Matthey, J.F. Malcolm.

Courses for Non-Majors. The department offers a range of courses for non-majors. Philosophy 1 is a General Education course for the non-major. Students pursuing careers in agriculture and engineering might find Philosophy 5 especially useful, since this course provides practice in concise and logical writing. Science and mathematics students may find this course useful, as well as Philosophy 12, 107, 108, and 112. Pre-law students and students planning careers in medicine or the various health sciences may be interested in Philosophy 14, 114, 115, 118 and 119. The offerings at the upper division level include courses of direct relevance to students in psychology, history, art, sociology, anthropology, and political science.

Department Activities. The Philosophy department sponsors a lecture-seminar series of well-known philosophers who present papers in their fields of expertise. The department also operates ongoing faculty and graduate student colloquia. Undergraduate students are welcome to attend and join these discussions. Information can be obtained in the department office.

Graduate Study. The Department of Philosophy offers programs of study leading to the M.A. and Ph.D. degrees. In association with the Program on Economy, Justice and Society, the department also offers the Ph.D. in Philosophy with designated emphasis in Economy, Justice and Society. Detailed information may be obtained by writing to the Graduate Adviser.

Graduate Adviser. M. Jubien.

Courses in Philosophy (PHI)

Lower Division Courses

1. Introduction to Philosophy (4) I. Wedin; II. The Staff; III. Matthey

Lecture—3 hours; discussion—1 hour. Problems of philosophy through major writings from various periods. Problems are drawn from political, aesthetic, religious, metaphysical, and epistemological concerns of philosophy. General Education credit: Civilization and Culture.

5. Critical Reasoning (4) II. Friedman

Lecture—3 hours; discussion—1 hour. Criteria of good reasoning in everyday life and in science. Topics to be covered may include basic principles of deduction and induction; fallacies in reasoning; techniques and aids to reasoning; principles of scientific investigation; aids to clarity. Not open to students who have completed course 6.

***6. Critical Reasoning and Writing (4) III.** The Staff

Lecture—3 hours; discussion—1 hour. Topics to be covered may include criteria of good reasoning in everyday life and in science; basic principles of deduction and induction; fallacies in reasoning; techniques and aids to reasoning; principles of scientific investigation; aids to clarity. Critical papers emphasized. Not open to students who have completed course 5. Offered in alternate years.

11. Philosophy East and West (4) II. Friedman

Lecture—3 hours; discussion—1 hour. Comparative treatment of select theories in Eastern and Western philosophy, e.g., of self, God, being, knowledge, enlightenment. Topics selected from the following philosophies: Eastern—Buddhist, Confucian, Hindu, Taoist; and Western—Platonist, Aristotelian, Medieval Christian, Modern Rationalist/Empiricist, Kantian, Hegelian, Existentialist. Offered in alternate years. (Former course 10E.) General Education credit: Civilization and Culture.

12. Introduction to Symbolic Logic (4) I. King

Lecture—3 hours; discussion—1 hour. Sentence logic syntax and semantics. Truth tables. Transcription between sentence logic and English. Logical equivalence. Validity. Proof techniques.

13. The Person (4) III. Wollheim

Lecture—3 hours; discussion—1 hour. Examination of the concept of the person, that is, of our intuitions about what persons are, e.g., that persons are agents, that they have a distinct psychology, that they are rational, that they are language-users, that they are mortal. General Education credit: Civilization and Culture.

14. Ethical and Social Problems in Contemporary Society (4) II. Clark

Lecture—3 hours; term paper. Philosophical issues and positions involved in contemporary moral and social problems. Among possible topics are: civil disobedience and revolution, racial and sex discrimination, environment and population control, genetic engineering, technology and human values, sexual morality, freedom in society. General Education credit: Civilization and Culture.

21. History of Philosophy: Ancient (4) I. Malcolm

Lecture—3 hours; discussion—1 hour. Survey of Greek philosophy with special attention to the Pre-Socratics, Plato, and Aristotle. General Education credit: Civilization and Culture.

22. History of Philosophy: Seventeenth Century (4) II. Matthey

Lecture—3 hours; discussion—1 hour. Selections from Descartes, Spinoza, Leibniz and seventeenth century scientific thinkers. General Education credit: Civilization and Culture.

23. History of Philosophy: Eighteenth Century (4) III. Matthey

Lecture—3 hours; discussion—1 hour. Selections from Locke, Berkeley, Hume, and Kant. General Education credit: Civilization and Culture.

***24. Introduction to Ethics and Political Philosophy (4) I.** The Staff

Lecture—3 hours; discussion—1 hour. Reading of historical and contemporary works highlighting central problems in ethical theory and political philosophy. Why should we be moral? What is moral behavior? What is justice, both for the individual and for society? Is there a right of rebellion? General Education credit: Civilization and Culture.

31. Appraising Scientific Reasoning (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Introduction to scientific hypotheses and the kinds of reasoning used to justify such hypotheses. Emphasis on adequate justification, criteria, and strategies for distinguishing scientific from pseudoscientific theories.

Concrete historical and contemporary cases. General Education credit: Civilization and Culture or Nature and Environment.

90X. Lower Division Seminar in Philosophy (1-2) I, II, III. The Staff

Seminar—1-2 hours. Prerequisite: completion of fewer than 84 quarter units; completion of at least one course in philosophy; consent of instructor. Investigation of a selected topic in philosophy through readings, discussions, and written assignments. Emphasis upon student participation. Limited enrollment.

***98. Directed Group Study (1-5) I, II, III.** The Staff

(Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff

(Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

(Certain upper division courses may not be offered every year.)

101. Metaphysics (4) I. Jubien

Lecture—3 hours; discussion—1 hour. Prerequisite: one course in philosophy recommended. Theories of being. Such topics as reality, substance, universals, space, time, causality, becoming, body, experience, persons, freedom, and determinism. Views of the nature and method of metaphysics. Anti-metaphysical arguments. General Education credit: Civilization and Culture.

102. Theory of Knowledge (4) I. Matthey

Lecture—3 hours; discussion—1 hour. Prerequisite: one course in philosophy. Analysis of the concept of knowledge. The relation between knowledge, belief and truth. Development of foundationalist, coherentist and externalist theories of justified belief. Examination of skepticism. General Education credit: Civilization and Culture.

103. Philosophy of Mind (4) III. Wollheim

Lecture/discussion—3 hours; term paper. The relation between mind and body, our knowledge of other minds, and the explanation of mental acts. Discussion of such concepts as action, intention, and causation.

104. Introduction to Philosophy of Science (4) I. Teller

Lecture—3 hours; discussion—1 hour. Prerequisite: one course in philosophy or a science background recommended. Basic problems in the philosophy of science, common to the physical, biological, and social sciences. Analysis of explanation, confirmation theory, observational and theoretical terms, the nature of theories, operationalism and behaviorism, realism, reduction. General Education credit: Civilization and Culture.

105. Philosophy of Religion (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: one course in philosophy recommended. Logical, metaphysical, epistemological, and existential aspects of selected religious concepts and problems. General Education credit: Civilization and Culture.

***106. Science and Metaphysics (4) I.** The Staff

Lecture/discussion—3 hours; term paper. Prerequisite: one course in philosophy or consent of instructor. Intensive study of topics in metaphysics to which the results of modern science are or appear to be relevant: the nature of time, causation, determinism, physicalism, realism.

***107. Philosophy of the Physical Sciences (4) II.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: one philosophy course or a science background recommended. Nature of testability and confirmation of scientific hypotheses; nature of scientific laws, theories, explanations, and models. Problems of causality, determinism, induction, and probability; the structure of scientific revolutions. General Education credit: Civilization and Culture.

108. Philosophy of the Biological Sciences (4) II. Dietrich; III. Griesemer

Lecture—3 hours; discussion—1 hour. Prerequisite:

one course in biology or one course in philosophy. Scientific method in biology. Nature of biological theories, explanations, and models. Problems of evolutionary theory, ecology, genetics, and sociobiology. Science and human values. General Education credit: Civilization and Culture or Nature and Environment.

109. Philosophy of the Social Sciences (4) I. Teller

Lecture—3 hours; discussion—1 hour. Prerequisite: one course in philosophy or a social science recommended. The nature of the social sciences, their subject matter and methods. Similarities to and differences from natural and life sciences. Predicting and explaining human behavior. Behaviorism. Reduction, holism, and individualism. Related moral issues. The social sciences and philosophy. Offered in alternate years. General Education credit: Civilization and Culture.

***110. An Historical Introduction to the Philosophy of Science (4) II.** The Staff

Lecture/discussion—3 hours; term paper. Prerequisite: one course in philosophy. Several general topics in the philosophy of science introduced and discussed in the context of actual episodes in the development of the natural sciences. Impact of these scientific developments on philosophical thought of the immediately following historical period.

***111. Philosophy of Space and Time (4) II.** The Staff

Lecture/discussion—3 hours; term paper. Prerequisite: one upper division philosophy course. Philosophical problems of space and time. The philosophical implications of space-time theories, such as those of Newton and Einstein. Topics may include the nature of geometry, conventionalism, absolutist versus relativist views of space and time, philosophical impact of relativity theory.

112. Intermediate Symbolic Logic (4) II. Friedman

Lecture—3 hours; discussion—1 hour. Prerequisite: course 12 or consent of instructor. Predicate logic syntax and semantics. Transcription between predicate logic and English. Proof techniques. Identity, functions, and definite descriptions. Introduction to concepts of metatheory.

***113. Advanced Logic (4) III.** King

Lecture/discussion—4 hours. Prerequisite: course 112, or Mathematics 108 or the equivalent. Topics will vary between metalogic of First-Order logic through the Completeness and Löwenheim-Skolem theorems; and Zermelo-Fraenkel set theory typically axiomatized as a First-Order theory. May be repeated once when subject area differs.

114. History of Ethics (4) III. Clark

Lecture—3 hours; term paper. Prerequisite: one philosophy course. Study of some classic texts from the history of philosophical writing on central problems of ethics, taking the form either of a survey or concentrated examination of selected historical figures. Readings from such philosophers as Aristotle, Butler, Hume, Kant, Mill.

115. Problems in Normative Ethics (4) I. Copp

Lecture/discussion—3 hours; term paper. Prerequisite: one course in philosophy. Moral philosophy studied through examination of moral problems and the moral principles and common sense intuitions that bear on them. Problems discussed may include: animal rights, fetal rights, euthanasia, justice and health care, war, nuclear deterrence, world hunger, environmental protection.

***116. Ethical Theories (4) II.** The Staff

Lecture/discussion—3 hours; term paper. Prerequisite: one course in philosophy; one course in ethics recommended. Study of fundamental concepts and problems in ethical theory through an examination of classical and contemporary philosophical theories of ethics. Among the theories that may be discussed are utilitarianism, virtue theory, theories of natural rights, Kantian ethical theory, and contractarianism.

117. Foundations of Ethics (4) III. Clark

Lecture/discussion—3 hours; term paper. Prerequisite: one of courses 114, 115, 116, 101, or 137. Advanced investigation of questions about the nature and foundations of morality. Among the topics that may be discussed are moral realism and anti-realism, cognitivism and non-cognitivism, types of rela-

*Course not offered this academic year.

tivism, moral skepticism, normative language and normative belief.

118. Political Philosophy (4) II. Copp
Lecture/discussion—3 hours; term paper. Prerequisite: one course in philosophy. Intensive examination of some central concepts of political thought such as the state, sovereignty, rights, obligation, freedom, law, authority, and responsibility. General Education credit: Contemporary Societies. (Former course 117.)

119. Philosophy of Law (4) II. Copp
Lecture—3 hours; term paper. Prerequisite: one course in philosophy or consent of instructor. Philosophical theories of the nature of law, legal obligation, the relation of law and morals. Problems for law involving liberty and justice: freedom of expression, privacy, rights, discrimination and fairness, responsibility, and punishment. (Former course 116.)

121. Topics in Metaphysics (4) II. Jubien
Lecture/discussion—4 hours. Prerequisite: course 101. Examination of up to three topics in metaphysics, e.g., fatalism; necessity; identity; ontological categories; minds, bodies, and persons; space and time; freedom and determinism.

***122. Topics in Theory of Knowledge (4) II.** Matthey
Lecture/discussion—4 hours. Prerequisite: course 102. Examination of one or more topics in theory of knowledge, such as belief, skepticism, justification.

123. Aesthetics (4) III. Wollheim
Lecture/discussion—3 hours; term paper. Prerequisite: one course in philosophy recommended. Nature of art, of artistic creation, of the work of art, and of aesthetic experience; nature and validity of criticism; relations of art to its environment.

***127. Philosophy and Economics (4) III.** The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: one upper division course in philosophy. Study of issues at the intersection of economics and moral and political philosophy, e.g., the nature of value, the nature of justice, the nature of rationality, the measurability of human well-being.

***131. Philosophy of Logic and Mathematics (4) II.** Jubien

Lecture/discussion—3 hours; term paper. Prerequisite: course 12 or one course for credit in mathematics. Nature of formal systems and mathematical theories. Selected topics include logical and semantical paradoxes; foundations of mathematics; set theory, type theory, and intuitionistic theory; philosophy of geometry; philosophical implications of Gödel's incompleteness results.

***132. History of Logic (4) II.** Friedman
Lecture/discussion—3 hours; term paper. Prerequisite: one course in philosophy or logic recommended. Overview of the chief developments in the history of logic.

133. Topics in Mathematical Logic (4) III. King
Lecture/discussion—4 hours. Prerequisite: course 113 or Mathematics 125 or consent of instructor. Topics to be taken typically from the following: metalogic and model theory; axiomatic set theory and independence results; Gödel's incompleteness theorem; computability and recursion theory.

***134. Modal Logic (4) III.** King
Lecture—3 hours; discussion—1 hour. Prerequisite: course 112 or Mathematics 108 or the equivalent. Survey of the main systems of modal logic, including Lewis systems S4 and S5. "Possible worlds" semantics and formal proofs. Applications to epistemology, ethics, or temporality. Offered in alternate years.

***135. Alternative Logics (4) II.** Matthey
Lecture/discussion—4 hours. Prerequisite: course 12, Mathematics 108, or the equivalent. Alternatives to standard truth-functional logic, including many-valued logics, intuitionist logics, relevance logics, and non-monotonic logics.

137. Philosophy of Language (4) I. King
Lecture/discussion—3 hours; term paper. Prerequisite: one course in philosophy or linguistics. Discussion of philosophical theories of how languages work and philosophical problems arising from thinking about language. Emphasis on modern (1879–present) philosophical views on language.

***143. Hellenistic Philosophy (4) II.** The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: course 21. Focus on Greek and Roman philosophy after Aristotle, including Epicureanism, Stoicism, Skepticism, and neo-Platonism. Offered in alternate years.

145. Medieval Philosophy (4) III. Malcolm
Lecture/discussion—3 hours; written reports. Prerequisite: course 21. Study of major philosophers in the medieval period.

***151. Philosophy of the Nineteenth Century (4) I.** The Staff
Lecture/discussion—4 hours. Prerequisite: courses 21, 22, or 23 recommended. Idealism of Hegel, the pessimism of Schopenhauer, Marxism, the irrationalism of Kierkegaard, Nietzsche and Dostoevsky. General Education credit: Civilization and Culture.

***155. American Philosophy (4) I.** The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: one course in philosophy recommended. Study of such American thinkers as Peirce, James, Royce, Dewey, Santayana, Whitehead, and C.I. Lewis.

***156. Contemporary Analytic Philosophy (4) I.** King
Lecture/discussion—3 hours; term paper. Prerequisite: one course in philosophy. Consideration of central issues such as meaning/reference, analytic/synthetic, reductionism, formal and ordinary language, essential properties, ontological commitment, possible world semantics; influential works by philosophers such as Russell, Moore, Wittgenstein, Austin, Carnap, Quine, Putnam, Kripke, van Fraassen.

***158. Phenomenology and Existentialism in Germany (4) I.** The Staff
Lecture—3 hours; term paper. Prerequisite: course 23 recommended. Twentieth-century German thinkers such as Husserl, Heidegger, Jaspers.

***159. Phenomenology and Existentialism in France (4) II.** The Staff
Lecture—3 hours; term paper. Prerequisite: course 23 recommended. Twentieth-century French thinkers such as Sartre, Marcel, Merleau-Ponty.

***160. Pre-Socratics (4) III.** Malcolm
Lecture/discussion—3 hours; term paper. Prerequisite: course 21. Study of the metaphysical views of such pre-Socratic figures as the Milesians, the Pythagoreans, Heraclitus, Parmenides, Empedocles, Anaxagoras, and the atomists.

161. Plato (4) I. Malcolm
Lecture/discussion—3 hours. Prerequisite: course 21.

162. Aristotle (4) III. Wedin
Lecture/discussion—3 hours; term paper. Prerequisite: course 21. An overview of Aristotle's most central and influential writings. Topics selected from fields such as metaphysics, physics, ethics, logic, and psychology. Offered in alternate years.

168. Descartes (4) III. Friedman
Lecture/discussion—4 hours. Prerequisite: course 22.

***169. Spinoza (4) I.** Friedman
Lecture/discussion—4 hours. Prerequisite: course 22.

***170. Leibniz (4) I.** Matthey
Lecture/discussion—4 hours. Prerequisite: course 22. Survey of the philosophical writings of G. W. Leibniz. Topics include Leibniz's logic, the existence of God, human freedom, substance, and the relation between science and metaphysics. Offered in alternate years.

***172. Locke and Berkeley (4) I.** Matthey
Lecture—4 hours. Prerequisite: course 23. Examination of Locke's *Essay Concerning Human Understanding* and Berkeley's *Principles of Human Knowledge* and *Three Dialogues*. Topics include abstract ideas, existence of matter, primary and secondary qualities, the existence of God, and the nature of scientific knowledge.

174. Hume (4) I. Matthey
Lecture/discussion—4 hours. Prerequisite: course 23. Examination of David Hume's *Treatise of Human Nature* and related writings. Topics include space and time, necessity, induction, skepticism concerning the external world and concerning personal identity. Offered in alternate years.

175. Kant (4) II. Matthey
Lecture/discussion—4 hours. Prerequisite: course 23. Intensive examination of the *Critique of Pure Reason*. Topics include the extent and limitations of human cognition, space and time, substance and causality, freedom and determinism, and the existence of God. Offered in alternate years.

***177. Hegel (4) II.** The Staff
Lecture/discussion—4 hours. Prerequisite: course 23 and 175 recommended.

***190. Special Topics in the History of Philosophy (4) III.** The Staff
Lecture—3 hours; term paper. Intensive study of special topic, problem, or authors in the history of philosophy. May be repeated for credit.

193. Research in Philosophy (2) I, II, III. The Staff (Chairperson in charge)
Term paper/discussion—2 hours. Prerequisite: consent of instructor. Individual research resulting in a paper on a specific topic in one of various fields of philosophy. May be repeated twice for credit.

194HA-194HB. Honors Research Project (4-4) I, II, III. The Staff (Chairperson in charge)
Tutoring—3 hours; term paper. Prerequisite: consent of instructor; open to students who are members of the honors program in Philosophy. Completion of honors research project under direction of an instructor. Consult departmental Master Adviser for list of instructors available in a given quarter.

***198. Directed Group Study (1-5) I, II, III.** The Staff (Chairperson in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

201. Metaphysics (4) III. Jubien
Seminar—4 hours.

***202. Theory of Knowledge (4) I.** Friedman
Seminar—4 hours.

***206. Philosophical Argumentation (4) I.** The Staff
Seminar—3 hours; short papers. Prerequisite: graduate standing. Investigation and evaluation of philosophical arguments. Critical discussion of student papers on various aspects of philosophical disputes.

***207. Philosophy of Physics (4) I.** The Staff
Seminar—3 hours; term paper. Prerequisite: graduate standing in philosophy or consent of instructor. An intensive treatment of one (or more) topic(s) in the philosophy of physics, such as foundations of spacetime theories, the interpretation of quantum mechanics, foundations of statistical mechanics. May be repeated for credit with consent of instructor.

***208. Philosophy of Biology (4) I.** Griesemer
Seminar—3 hours; term paper. Prerequisite: graduate standing in philosophy or consent of instructor. Intensive treatment of one or more general topics in the philosophy of biology, such as foundations of evolutionary theories, reductionism in biology, sociobiology, and cultural evolution. May be repeated for credit with consent of instructor.

***210. Philosophy of Science (4) I.** Teller
Seminar—3 hours; term paper. Prerequisite: graduate standing in philosophy or consent of instructor. Treatment of one or more general topics of current interest in the philosophy of science, such as scientific explanation, theories of confirmation, scientific realism, reduction in physics and biology. Course may be repeated for credit with consent of instructor.

***212. Philosophy of Logic and Mathematics (4) II.** Friedman
Seminar—3 hours; term paper. Prerequisite: course 112 or 113, or Mathematics 108 or 125, or the equivalent. Philosophical issues in logic and mathematics. Topics may include nature of logical and mathematical truth or knowledge; correctness of logical systems; foundations of mathematics; metaphysical and epistemological presuppositions; applications to philosophical problems and formalization of philosophical theories.

214. Ethics (4) I. Copp; II. Clark
Seminar—3 hours; term paper.

***217. Political Philosophy** (4) I. Copp
Seminar—3 hours; term paper. Prerequisite: graduate student standing. Advanced study of issues in political philosophy. May be repeated for credit with consent of instructor.

237. Philosophy of Language (4) III. King
Seminar—3 hours; term paper. Prerequisite: graduate standing in philosophy or consent of instructor. Study of philosophical issues raised by language, such as the nature of semantic content, proper semantics for verbs of propositional attitude, feasibility and limitations of formal semantics and pragmatics for natural languages. May be repeated for credit with consent of instructor when the content is sufficiently distinct.

261. Plato (4) III. Malcolm
Seminar—3 hours.

262. Aristotle (4) I. Wedin
Seminar—3 hours.

***275. Kant** (4) I. Matthey
Seminar—3 hours.

***290. History of Philosophy** (4) II. Friedman
Seminar—3 hours. Special topics in the history of philosophy.

***293. The Emotions** (4) I. Wollheim
Seminar—3 hours; term paper. Prerequisite: graduate standing; open to undergraduates with consent of instructor. Considers the emotions in their full variety. Relates emotion to desire, to belief, to sensation, to behavior, and to rationality. Cultural interpretations of emotion will be reviewed. Ancient and modern writers will be read. Offered in alternate years.

***298. Group Study** (1-5) I. Teller; II. Wollheim

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Physical Education

(College of Letters and Science)

Keith R. Williams, Ph.D., Chairperson of the Department

Department Office, 264 Hickey Gymnasium
(916-752-0511)

Faculty

G. Robert Biggs, B.A., Associate Supervisor

Bobbie J. Bolden, M.A., Supervisor

Stephen T. Bronzon, M.S., Lecturer

Simon Davies, Ph.D., Lecturer

Kathleen M. DeYoung, B.A., Supervisor

Pamela L. Gill-Fisher, M.A., Supervisor

Raymond S. Goldbar, M.A., Supervisor

David Hawkins, Ph.D., Assistant Professor

Jorja E. Hoehn, M.S., Lecturer

Robert G. Holly, Ph.D., Supervisor

Barbara A. Jahn, M.S., Supervisor

Susan E. Jennings, Ph.D., Lecturer

Paul A. Molé, Ph.D., Professor

Marlene F. Piper, Ed.D., Supervisor

Melvin R. Ramey, Ph.D., Professor (Civil and Environmental Engineering)

Phillip S. Swimley, M.A., Supervisor

Deanne M. Vochatzer, M.A., Assistant Supervisor

Jon E. Vochatzer, M.S., Supervisor

Keith R. Williams, Ph.D., Associate Professor

Robert A. Williams, M.A., Lecturer

Suzanne C. Williams, M.S., Supervisor

Emeriti Faculty

William C. Adams, Ph.D., Professor Emeritus

Edmund M. Bernauer, Ph.D., Professor Emeritus

Charles R. Kovacic, Ed.D., Professor Emeritus

Willard S. Lotter, Ed.D., Senior Lecturer Emeritus

E. Dean Ryan, Ed.D., Professor Emeritus

The Major Program

The mission of the Department of Physical Education is the integrative study of physical activity and its adaptive consequences on human form and function.

The Program. The undergraduate major may select either the Bachelor of Arts or the Bachelor of Science degree program. The Bachelor of Arts is designed primarily for those students who desire a liberal arts program with a broadly based lower division curriculum. This program permits specialization in either the biological or psychological aspects of physical education, and is most appropriate for those who intend to pursue careers in coaching, teaching, or in community/corporate exercise programs, and for those intending graduate study in the behavioral aspects of sport and exercise.

The Bachelor of Science program is designed for students desiring a more intense curriculum in the natural sciences. It involves more extensive physical and life science preparation in lower division courses, and requires additional upper division course work more specific to either biomechanics or exercise physiology. This degree program provides preparation for graduate study in exercise and sport science, for careers in the allied health sciences, and for professional schools in medicine, physical therapy, and podiatry.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	32-35
Biological Sciences 1A.....	5
Chemistry 2A, 2B.....	10
Physical Education 45.....	3
Physics 1A or 5A.....	3-4
Psychology 1 or 15.....	3-4
Statistics 13.....	4
Additional requirements:	
<i>Biological emphasis</i> —Biological Sciences 1B.....	5
<i>Psychological emphasis</i> —Psychology 41.....	4

Depth Subject Matter

Cell Biology and Human Anatomy 101.....	4
Cell Biology and Human Anatomy 101L.....	2
Physical Education 101, 101L, 102, 103, 104, 105.....	16
Neurobiology, Physiology and Behavior 101.....	5

Minimum of 12 upper division units in physical education chosen with approval by a major adviser.....12

Biological emphasis:

Students electing this emphasis must select a minimum of 9 units from Physical Education 110, 111, 112, 113, 115, 117, or 118.

Psychological emphasis:

Students electing this emphasis must select a minimum of 7 units from Physical Education 120, 121, 122, or 125.

Minimum of 4 upper division non-physical education units in either the biological or the psychological area selected from the following lists. Substitutes may be made only with the prior written approval of a major adviser.

Biological emphasis: Anthropology 101, 152 or 153, Biological Sciences 101, Neurobiology, Physiology and Behavior 113, or Nutrition 101.....4

Psychological emphasis: Psychology 114, 115, 136, 143, 145, or 160.....4

No variable-unit courses or Physical Education 143A, 143B, 144, 146, 146L, 147L, 148, 148L or 149L may be used to fulfill these requirements. Consult your adviser regularly.

Total Units for the Major.....**75-77**

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	53-59
Anthropology 1.....	4
Biological Sciences 1A.....	5
Chemistry 2A-2B or 2AH-2BH.....	10
Computer science (Computer Science Engineering 10, 15, 30, or Engineering 5).....	4
Mathematics 16A-16B or 21A-21B.....	6-8
Physical Education 45.....	3
Physics 5A-5B or 9A-9B.....	8
Psychology 1 or 15.....	3-4
Statistics 13 or 102.....	4
Additional Requirements	
<i>Biomechanics emphasis:</i> Biological Sciences 1B, and Physics 5C or 9C.....	9
<i>Exercise Physiology emphasis:</i> Chemistry 8A-8B, or 118A-118B.....	6-8

Depth Subject Matter

Cell Biology and Human Anatomy 101, 101L.....	6
Physical Education 101, 101L, 102, 103, 104, 105.....	16
Neurobiology, Physiology and Behavior 101, 101L.....	7
Restricted electives.....	24

1. Minimum of 10 upper division units from outside the major selected with adviser's approval and as restricted below.

Biomechanics emphasis: at least 3 of the 10 units must be selected from the following: Engineering 102A, Neurobiology, Physiology and Behavior 112, Evolution and Ecology 170, 170L.

Exercise Physiology emphasis: at least 6 of the 10 units must be selected from the following: Biological Sciences 102 or Nutrition, 110; Neurobiology, Physiology and Behavior 112, 113, 140.

2. Minimum of 12 upper division units of Physical Education courses, including *Biomechanics emphasis:* Physical Education 113, 115, 125.

Exercise Physiology emphasis: at least 9 of the 12 units must be selected from Physical Education 110, 111, 112, 113, 117, 118.

No variable-unit courses or Physical Education 143A, 143B, 144, 146, 146L, 147L, 148, 148L or 149L may be used to fulfill these requirements. Consult your adviser regularly.

Total Units for the Major.....**104-110**

Honors Program. Those students with outstanding records in the major requirements may elect to enter the Honors Program with the consent of an adviser. A senior project must be completed, for which up to 10 units (minimum of 6 units) of Physical Education 199 (split over two quarters) may be earned. These units are taken in addition to the major requirements, and it should be realized that only a maximum of ten 199 units may be counted toward the B.S. degree total unit requirement.

Major Advisers. W. C. Adams, D. Hawkins, R. G. Holly, S.E. Jennings, P. A. Molé, K. R. Williams.

Teaching Major. The teacher-training curriculum in physical education requires courses in addition to the departmental major requirements.

Minor Program Requirements:

	UNITS
Physical Education	18

At least 18 upper division units in physical education from one of three options....18

a. *Biomechanics*

1) Physical Education 103 and one course from 101, 102, 104, 105.

2) Minimum of two courses from Physical Education 113, 115, 125.

3) Additional courses to complete a total of 18 upper division units. No variable-unit

courses or Physical Education 143A, 143B, 144, 146, 146L, 147L, 148, 148L or 149L may be used to fulfill these requirements. Consult your adviser regularly.

b. Exercise Physiology

1) Physical Education 101 and 101L, and one course from 102, 103, 104, 105.

2) Minimum of three courses from Physical Education 110, 111, 112, 113, 117, 118.

3) Additional courses to complete a total of 18 upper division units. No variable-unit courses or Physical Education 143A, 143B, 144, 146, 146L, 147L, 148, 148L or 149L may be used to fulfill these requirements. Consult your adviser regularly.

c. Psychological Aspects

1) Physical Education 105, and one course from 101, 102, 103, 104.

2) Minimum of two courses from Physical Education 120, 121, 122, 125.

3) Additional courses to complete a total of 18 upper division units. No variable-unit courses or Physical Education 143A, 143B, 144, 146, 146L, 147L, 148, 148L or 149L may be used to fulfill these requirements. Consult your adviser regularly.

Minor Advisers. Same as major advisers.

Teaching Credential Subject Representative. R.S. Goldbar. See also the section on the Teacher Education Program.

Graduate Study. A program of study and research leading to the M.A. or M.S. degree is available in physical education. For detailed information regarding graduate study, write to the Graduate Adviser, Department of Physical Education. See also the Graduate Studies section in this catalog. *Admission into the graduate program in Physical Education and into the graduate program in Exercise Science is closed for the 1994-95 academic year.*

Graduate Adviser. W.C. Adams.

Class and Recreational Use of Facilities. The incidental fee payable by all students at the time of registration, entitles students to the use of gymnasium, showers, towels, lockers, tennis courts, and the athletic fields. Certain equipment for games and sports is available for exercise and recreation, either with or without instruction. Lockers will be turned in on the last day of class, i.e., before the final examination period. Fines are imposed for each formal transaction necessitated by failure of the student to comply with the regulations of the department.

Courses in Physical Education (PHE)

Lower Division Courses

1. Physical Education for Men and Women (1/2) I, II, III. The Staff (Chairperson in charge)

Laboratory—2 hours. Sections in: (a) sports skills, rules and strategy; (b) physical fitness and personal health; (c) recreation; (d) dance, and (e) intercollegiate athletics. May be repeated for a total of 6 units. (P/NP grading only.)

***2. Principles of Basic Exercise Conditioning (2) I.** (Swimley in charge)

Lecture—1 hour; laboratory—2 hours. A survey of the basic concepts, facts, and accepted approaches current in selected exercise training regimens, e.g., theory of aerobic function and capacity, exercise and diet in weight control, muscular strength development and maintenance, and limitations of environment, age, and gender on fitness levels. (P/NP grading only.)

***5. Foundations of Emergency First Aid Services (2) I, II, III.** The Staff (— in charge)

Lecture—1 hour; laboratory—1 hour. An introduction to the basic principles and practices that fulfill the prerequisites for advanced study in First Aid and Emergency Medical Services. Upon successful completion of course the Standard Red Cross Certificate is awarded.

6. Preparation and Participation in ICA Competition (1) I, II, III. ICA Staff (Director in charge)

Discussion-laboratory—10-20 hours. Prerequisite: consent of instructor (coach). Preparation and participation in Intercollegiate Athletics. Development of fundamental and advanced individual and team skills. In-depth knowledge of rules and strategy. Advanced sports competition and Conference and NCAA levels. May be repeated for a total of 6 units. (P/NP grading only.)

7. Professional Physical Education Activities: Men and Women (1) I, II, III. The Staff (Chairperson in charge)

Lecture—1 hour; or laboratory—2 hours. Fundamental skills for: (a) coaching competitive athletics; (b) classroom teaching and coaching, and (c) classroom teaching and officiating. May be repeated for a total of six units.

15. Administration of Intramural Sports (2) I.

Colberg
Lecture—2 hours. Planning and administering intramural sports programs at the high school and college level.

25. Theory of Lifesaving and Water Safety (2) I, II, III. Jahn

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 5; sound physical condition, and no physical handicap that would render student unable to perform the required skills and ability to pass preliminary swimming test. Provides the student with the knowledge, organizational procedures, and skill development necessary to provide for water safety and save his/her own life or the life of another in an aquatic emergency. (American Red Cross Advanced Lifesaving Certificate awarded upon successful completion of necessary requirements.)

27. Training Course for Water Safety Instructors (2) III. Jahn

Lecture—1 hour; laboratory—2 hours. Prerequisite: advanced swimming (course 1) or consent of instructor; course 5 and current Advanced Life-Saving Certificate. Theoretical knowledge and practical experience necessary for the organization and teaching of swimming and lifesaving classes. (American Red Cross Water Safety Instructor's Certificate awarded upon successful completion of necessary requirements.)

29. Basic Scuba (2) I, III. Fastenau

Lecture—2 hours; laboratory—2 hours. Prerequisite: good physical condition, ability to pass preliminary swim test. Introduction to basic knowledge required for scuba diving, function and maintenance of equipment, physics and physiology of diving, diver first aid and CPR, oceanography and marine life, and underwater communication. Pool and open water sessions available for certification. (P/NP grading only.)

35A. Dance Composition (2) I. Bolden

Laboratory—5 hours. Prerequisite: course 1, modern jazz or jazz dance techniques, or consent of instructor. Composing phrases of movement with a knowledge of elements involved in the craft of choreography: design, dynamics, rhythm, motivation and gesture, vocabulary.

35B. Dance Composition (2) II. Bolden

Laboratory—5 hours. Prerequisite: course 35A or consent of instructor. To learn the elements of dance production as it applies to the use of lighting, costume design, selection of music, and building of stage props.

35C. Dance Composition (2) III. Bolden

Laboratory—5 hours. Prerequisite: courses 35A, 35B, or consent of instructor. To encourage the student to create new dance forms and prepare them for a 4-7 minute presentation in a spring concert on stage. Costumes and lighting will be created and correlated for each dance by the choreographer.

***36A-36B. History of Dance (3-3) I-II.** ———

Lecture—3 hours. Study of dance and its relation to culture from the primitive to the Renaissance periods. The development of dance as an art form from the Baroque period to the twentieth century.

44. Principles of Healthful Living (2) II, III.

Gill-Fisher

Lecture—2 hours. Application of scientific and empirical knowledge to personal, family, and community health problems. (P/NP grading only.)

45. Foundations of Physical Education (3) I.

Adams

Lecture—3 hours. An introduction to historical, biomechanical, physiological, psychological and sociological foundations of physical education.

92. Physical Education Internship (2-5) I, II, III. The Staff (Chairperson in charge)

Internship—6-15 hours; written project proposal and evaluation. Prerequisite: consent of instructor; enrollment dependent on availability of intern positions, with priority given to Physical Education majors. Work experience in the application of physical activity programs to teaching, recreational, clinical or research situations under department faculty supervision. May be repeated for credit once but no internship units will be counted toward Physical Education major. (P/NP grading only.)

97T. Tutoring in Physical Education (1-5) I, II, III.

The Staff (Chairperson in charge)

Tutorial—1-5 hours. Prerequisite: lower division standing and consent of Department Chairperson. Tutoring of students in lower division physical activity courses. Weekly meetings with instructor in charge of courses. Written reports on methods and materials required. May be repeated once for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge)

Prerequisite: consent of instructor and Department Chairperson. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III.

The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Field Experience in Teaching Physical Education (2) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour; field work—4 hours. Prerequisite: upper division standing and appropriate course 1 or 7. Tutoring or teacher's aide in physical education activities, including athletic coaching, in public schools under the guidance of a regular teacher with supervision by a departmental faculty person. May be repeated once for credit. (P/NP grading only.)

101. Physiological Regulation During Exercise (3) I. ———, Molé

Lecture—3 hours. Prerequisite: Biological Sciences 1A; Neurobiology, Physiology and Behavior 101. Review of physiological mechanisms underlying acute exercise response. Focus is on physiological regulation and control in response to metabolic demand. Metabolism, fluid composition, acid-base, and temperature regulation are studied in relation to control by the cardiovascular, respiratory, and renal systems.

101L. Exercise Physiology Laboratory (1) Molé

Laboratory—3 hours (for 5 weeks); discussion—2.5 hours (for 5 weeks). Prerequisite: course 101 (may be taken concurrently), Biological Sciences 1A, Physiology 110. Series of laboratory experiments demonstrating the principles of physiological regulation to standardized exercise regimens. The assessment of physiological, environmental and anthropological factors limiting exercise capacities performed on quantitatively controlled ergometric devices, while monitoring physiological variables by noninvasive methods.

102. Physiological Adaptations to Exercise (2) II.

Adams, ———

Lecture—2 hours. Prerequisite: course 101 or consent of instructor. Study of physiological capacities with reference to genotypic and adaptive aspects. Analysis of physiological adaptations to chronic physical activity and selected environmental stressors.

103. Analysis of Human Movement (4) III. Hawkins

Lecture—3 hours; laboratory—3 hours to alternate weekly with discussion—1 hour. Prerequisite: Cell

Biology and Human Anatomy 101 and Physics 1A; Physics 5A recommended. Anatomical and mechanical fundamentals of human motion. Qualitative and quantitative application of kinesiological principles to a variety of movement situations.

104. Introduction to Motor Control and Skill Acquisition (3) I. Jennings

Lecture—2 hours; discussion—1 hour to alternate weekly with laboratory—3 hours. Prerequisite: upper division standing; Psychology 1 or 15, and course 45. Analysis of variables affecting the ability to produce, learn, and retain movement skills. Basic neurophysiological and behavioral accounts of motor control processes are examined. Theories of movement retention and motor learning are covered.

105. Psychosocial Factors in Motor Performance (3) II. Jennings

Lecture—3 hours. Prerequisite: Psychology 1, 15, or 16. Survey of theories and experimental findings from social psychology and human motivation and their application to motor performance, including sex differences, success and failure, expectations, anxiety, competition, and aggression.

110. Exercise Metabolism (3) II. Molé

Lecture—2 hours; laboratory—five 4-hour sessions. Prerequisite: courses 101, 102; Chemistry 2A. Focus on energy metabolic pathways and fuels used during different modes of exercise. Also, exercise-induced adaptations which affect metabolism and performance will be discussed. Experiments in laboratory will utilize a variety of techniques to characterize the metabolic responses to exercise.

111. Environmental Effects on Physical Performance (3) III. Adams, ———

Lecture—2 hours; laboratory—3 hours, with discussion—1 hour (alternate weeks). Prerequisite: courses 101 and 102, or consent of instructor. The effects of thermal, barometric and gravitational conditions on physiological function and physical performance of humans. Acute and chronic effects, emphasizing physiological adaptations and limitations, will be studied.

112. Clinical Exercise Physiology (4) III. Holly

Lecture—3 hours; laboratory—3 hours to alternate weekly with discussion—1 hour. Prerequisite: courses 101 and 102, or consent of instructor. Physical activity as a therapeutic modality is examined in normal and diseased populations (cardiovascular, pulmonary, diabetic). Assessment (graded exercise testing), exercise prescription and effects of exercise conditioning are examined in detail.

113. Growth and Development in Human Performance (3) II. Adams, Molé

Lecture—3 hours. Prerequisite: Biological Sciences 1A, Cell Biology and Human Anatomy 101, and Neurobiology, Physiology and Behavior 101. Development of human performance potential from conception to old age, including influence of exercise, athletic participation, and preventive medicine. Alterations in motor skill patterns, morphology, and body composition, and physiological capacities with aging.

115. Biomechanical Bases of Movement (3) I. K. Williams

Lecture—2 hours; laboratory—3 hours to alternate weekly with discussion—1 hour. Prerequisite: course 103 or consent of instructor. Biomechanical bases of human movement investigated; topics include musculo-skeletal mechanics, tissue mechanics, electromyography, and measurement and analysis techniques. Application made to sport, clinical, and work environments, including extensive analysis of locomotion.

116. Nutrition for Physically Active Persons (3) III. Molé

Lecture—3 hours. Prerequisite: course 101, Neurobiology, Physiology and Behavior 110. The role of nutrition and exercise in modifying metabolism, body composition, performance and health of humans.

117. Exercise and Aging in Health and Disease (3) II. Holly

Lecture—2 hours; discussion—1 hour. Prerequisite: course 101 or 102 (concurrently) or 113 (concurrently). Etiology of and standard therapy for various

diseases associated with aging (e.g., cardiovascular, pulmonary and renal diseases, diabetes, obesity, lipemias, etc.). Exercise will then be considered as a protective and/or therapeutic modality.

118. Physical Fitness in the Workplace (3) III. The Staff

Lecture—2 hours; discussion—1 hour. Explores principles and practices of health promotion in the workplace. Established assessment procedures including validation of job standards are presented. Cost and health benefits are examined with respect to onsite and offsite programs of fitness maintenance and remediation.

120. Sports in American Society (4) I. Gill-Fisher

Lecture—3 hours; discussion—1 hour. Historical development of sport in American society. Relationship and interaction of sport and politics, economics, religion, art, sexism, racism, and education; current trends and problems.

121. Sports Psychology (4) III. Jennings

Lecture—3 hours; discussion—1 hour. Prerequisite: course 105 and Psychology 145. Consideration of major theories, research findings and methods of data collection in sport psychology through a critical examination of relevant experimental, clinical, and field data.

122. Psychological Effects of Physical Activity (3) II. Jennings

Lecture—3 hours. Prerequisite: Psychology 1 or 15, and upper division standing. Physical activity is evaluated in terms of its ability to enhance the quality of life. Topics studied include: individual factors (self concept, type A); special populations (elderly, cardiovascular); and mental health changes (depression, anxiety).

125. Neuromuscular and Behavioral Aspects of Motor Control (3) II. Hawkins

Lecture—2 hours; discussion—1 hour to alternate weekly with laboratory—2 hours. Prerequisite: course 104. Factors which affect control of movement from neuropsychological, physiological, behavioral, and mechanical viewpoints. Topics include central vs. peripheral control mechanisms, open and closed loop theories, motor programming, cognitive learning strategies, and the effects of biochemical and biomechanical influences.

128A. Research Diving: 65 Feet (1) II. Fastenau

Lecture—1 hour; laboratory—1/2 hour. Prerequisite: basic Scuba Certification from approved agency (course 29 or the equivalent); 10 logged open-water dives since certification; consent of instructor. Lectures in diver rescue, and resuscitation, navigation, search and light salvage, night diving, research methods, work performance under water, cold-water diving, blue-water diving, introduction to deep diving. Pool and open water sessions available for certification (contact Department Office for details). (P/NP grading only.)

128B. Research Diving: 65 Feet (2) III. Fastenau

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 128A; consent of instructor. Lectures in diver rescue and resuscitation, navigation, search and light salvage, night diving, research methods, work performance under water, cold-water diving, blue-water diving, introduction to deep diving. Pool and open water sessions available for certification (contact Department Office for details). (P/NP grading only.)

131. Physical Education for the Handicapped (4) I. Vochatzer

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 103 and consent of instructor. The role of exercise, physical retraining and remedial work in the improvement of movement for handicapped individuals.

***132. First Aid Leadership and Accident Management** (3) I, II, III. ———

Lecture—2 hours; students assist in teaching course 5—1 hour to be arranged. Prerequisite: course 5 or American Red Cross Advanced First Aid Card. Administration, organization and supervision of safety and first aid programs in school and community sports, recreation and all types of group activities. The study and practice of first aid leadership skills. (The

American Red Cross First Aid Instructor Card will be awarded upon successful completion of the course.)

133. Prevention and Care of Sports Injuries (3) II. The Staff (Chairperson in charge)

Lecture—1 hour; laboratory—6 hours. Prerequisite: upper division standing; Cell Biology and Human Anatomy 101 (may be taken concurrently). Management of the prevention, care, and rehabilitation of injuries incurred by athletes. Laboratory on anatomy, emergency care, physical therapy methods, and taping techniques.

135. Advanced Procedures in Evaluation and Management of Athletic Injuries (3) III. The Staff (Chairperson in charge)

Lecture—3 hours. Prerequisite: course 133, Cell Biology and Human Anatomy 101, and consent of instructor. Advanced study of the evaluation and management of athletic injuries, including mechanism of injury, biomechanics and pathophysiology. In-depth study of selected current topics in athletic training.

142. Physical Education in the Public Schools (3) II. Piper

Lecture—3 hours. Analysis and study of the principles and methods basic to teaching physical education at the elementary and secondary levels.

***143A. Coaching Effectiveness** (2) I. The Staff

Lecture—2 hours. Prerequisite: consent of instructor. Synthesis and application of basic components of sport psychology, sport pedagogy, and sport physiology to coaching. (P/NP grading only.)

***143B. Coaching Effectiveness** (2) II. The Staff

Lecture—2 hours. Prerequisite: course 143A. Application of general principles of management and administration to athletic coaching in high school. (P/NP grading only.)

***144. Principles of Health Education** (2) II.

Lecture—2 hours. Prerequisite: course 44 and upper division standing or consent of instructor. Principles of teaching health education in the public schools. (P/NP grading only.)

***145. Administration of Health/Fitness Programs** (2) III. ———

Lecture—2 hours. Principles of organizing and directing health/fitness programs. Includes selection and training of personnel, methods of evaluating personnel and programs, and elements of planning.

***146. Theory and Practice of Exercise Training** (1) I, II, III. Jennings

Lecture/discussion—1 hour. Prerequisite: course 2 or 45 or 102. Physiological adaptations, exercise programming and behavioral techniques focusing on young and middle-aged adults. Topics include exercise prescription, nutrition, psychological effects of exercise, stress management techniques, and exercise adherence techniques. (P/NP grading only.)

***146L. Shape-Up Testing and Training Laboratory** (1) I, II, III. Jennings

Laboratory—3 hours. Prerequisite: course 146 (may be taken concurrently). Primary activities involve leading shape-up class, attending workshops, testing sessions, and completing final reports. May be repeated once for credit. (P/NP grading only.)

147L. Adult Fitness Training Laboratory (1) I, II, III. Jennings

Laboratory—3 hours. Prerequisite: courses 146, 146L, and 102 (may be taken concurrently); current CPR. Involves attending and assisting with aerobic training sessions for older adults, and assisting with physiological testing sessions. (P/NP grading only.)

148. Theory and Practice of Exercise Testing (1) I, II, III. Holly

Lecture/discussion—1 hour. Prerequisite: courses 101, 102, 112 (may be taken concurrently), and 146; current CPR. Theory and practice of exercise testing applied to older adult populations. Physiological responses to and limitations of exercise testing. Application of exercise testing and training to healthy and diseased populations. (P/NP grading only.)

148L. Adult Fitness Testing Laboratory (1) I, II, III. Holly

Laboratory—3 hours. Prerequisite: courses 146, 148 (concurrently); current CPR. Testing symptomatic and

asymptomatic older adults for functional aerobic capacity, body composition, blood lipids, pulmonary function, and cardiovascular disease risk. Counseling adults in appropriate exercise programs and lifestyle modifications. Two quarters minimum; third quarter permitted. (P/NP grading only.)

149L. Cardiopulmonary Rehabilitation Laboratory (1) I, II, III. Holly

Laboratory—3 hours. Prerequisite: courses 148 and 148L; current CPR certification. Testing and training of cardiac patients or individuals at high risk of developing heart disease. Present mini-lectures to program participants, maintain patient records, and present patients' cases in rounds. Two quarters minimum; third quarter permitted. (P/NP grading only.)

150. Recreation in the Community (3) III. Jahn

Lecture—2 hours; discussion—1 hour; two Saturday field trips—8 hours. The nature and scope of community recreation programs in California emphasizing low income, highly populated areas, and poor rural communities.

192. Physical Education Internship (2-12) I, II, III.

The Staff (Chairperson in charge)

Internship—6-36 hours; written project proposal and evaluation. Prerequisite: upper division standing and consent of instructor; enrollment dependent on availability of intern positions, with priority given to Physical Education majors. Work experience in the application of physical activity programs to teaching, recreational, clinical or research situations under department faculty supervision. May be repeated for credit for total of 12 units (including course 92), but no internship units will be counted toward Physical Education major. (P/NP grading only.)

197T. Tutoring in Physical Education (1-5) I, II, III.

The Staff (Chairperson in charge)

Tutorial—1-5 hours. Prerequisite: consent of chairperson. Tutoring of students in lower division physical activity courses. Written reports on methods and materials required. May be repeated once for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge)

Prerequisite: consent of instructor and Department Chairperson. (P/NP grading only.)

199. Special Study for Advanced Undergraduates

(1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of Department Chairperson. (P/NP grading only.)

Graduate Courses

200A. Introduction to Research: History and Philosophy in Physical Education (2) I. Molé

Discussion—1 hour; seminar—1 hour. Prerequisite: consent of instructor. Fundamental tenets of science and their application to current research in human performance; benchmark studies in the evolution of the field.

200B. Problem Solving and Research Design in Physical Education (2) III. Jennings, —

Discussion—1 hour; seminar—1 hour. Prerequisite: course 200A. Conventional approaches to problem solving; processes in research design and analysis; written and oral presentation of a thesis proposal.

***201A. Sports Medicine: Medical Aspects of Sports Injuries** (3) I. —

Lecture—2 hours; laboratory—1 hour. Prerequisite: graduate students with upper division course in systemic physiology or anatomy, and medical students. Multidisciplinary course introducing student to the pathophysiology of sports injuries, physical examination of the injured athlete, and management of sports injuries. Specific injuries, taping, and use of physical modalities will be discussed.

***220. Research Topics in Biomechanics** (3) III. K. Williams

Lecture—2 hours; seminar—1 hour. Prerequisite: graduate standing; course 115 recommended. Survey of current research into diverse areas of biomechanics of human movement. Topics include locomotion, sport biomechanics, electromyography, musculo-skeletal and tissue mechanics, advances in

measurement technology, and clinical biomechanics. Offered in alternate years.

221. Anthropometry in Physical Activity (3) III.

Adams

Lecture—2 hours; laboratory—five 3-hour sessions to alternate weekly with five 1-hour discussion sessions. Prerequisite: courses 101 and 102. Consideration of physical constitution, body proportions, and body composition in man as they affect physical performance, and of body structural and compositional changes accompanying prolonged, systematic physical conditioning. Offered in alternate years.

222. Metabolic Functions in Exercise (4) III. Molé

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 102, Neurobiology, Physiology and Behavior 101. Review of the current research literature on the metabolic responses to exercise in man; a laboratory survey of respiratory response, metabolic and water balances, blood gas adjustments and acid-base balance with particular reference to the effect of environmental conditions.

223. Physiological Basis of Physical Fitness (2) II.

Seminar—2 hours. Prerequisite: graduate standing. Review and critical discussion of current research topics concerned with the physiological aspects of physical training and adaptation. Offered in alternate years.

***224. Exercise Electrocardiography** (2) I. Holly

Lecture—2 hours. Prerequisite: course 112 or consent of instructor. Physiological bases and clinical implications of normal and abnormal exercise electrocardiograms (ECG) are treated in detail. Exercise prescription is considered as is the predictive significance of normal and abnormal ECG. Offered in alternate years.

225. Seminar in Cardiac Rehabilitation (2) I. Holly

Seminar—2 hours. Prerequisite: course 112 or graduate standing and consent of instructor. Critical examination of literature dealing with the causes, prevention and treatment of cardiovascular disease with particular emphasis on intervention through cardiac rehabilitation. Both the theoretical bases and practical approaches to cardiac rehabilitation will be examined. Offered in alternate years.

226. Measurement of the Biological Aspects of Human Performance (3) I. The Staff (Adams in charge)

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 101; consent of instructor. Introduction to primary measurement strategies used to investigate the biological bases of human performance. Emphasis placed on the critical selection of the most valid tests and on obtaining the most accurate and reliable results.

227. Research Techniques in Biomechanics (4) II.

Williams, Hawkins

Lecture—2 hours; laboratory—4 hours; Term Paper/Discussion—1 hour. Prerequisite: consent of instructor, Mathematics 22B; course 115 recommended. Experimental techniques for biomechanical analysis of human movement are examined. Techniques evaluated include data acquisition and analysis by computer, force platform analysis, strength assessment, planar and three-dimensional videography, data reduction and smoothing, body segment parameter determination, electromyography, and biomechanical modeling. (Same course as Biomedical Engineering 227/Mechanical Engineering 227.)

228. Skeletal Muscle Mechanics: Form, Function, Adaptability (3) III. Hawkins

Lecture—3 hours. Prerequisite: graduate standing, consent of instructor, and basic background in biology, physiology, and engineering; Engineering 3 and 45, Mathematics 22B, and Neurobiology, Physiology and Behavior 110 recommended. Basic structure and function of skeletal muscle is examined at the microscopic and macroscopic level. Muscle adaptation in response to aging, disease, injury, exercise, and disuse. Special emphasis on the relation between muscle structure and muscle mechanics (e.g., force, work, power). (Same course as Biomedical Engineering 228.)

***230. Human Performance: Psychological Aspects** (3) II. —

Seminar—3 hours. Prerequisite: course 105 or consent of instructor. Critical review of current literature on learning with emphasis on social learning theory and its application to clinical problems related to exercise and sport.

232. Health Psychology: Effects of Physical Activity (3) I. Jennings

Seminar—3 hours. Prerequisite: course 122 or consent of instructor. Analysis of research on the role of physical activity in developing, maintaining, or changing personality and affective states. Special attention will be paid to the potential effect of exercise on mental health.

290. Seminar in Physical Education (1) II. The Staff (— in charge)

Seminar—1 hour. Prerequisite: graduate standing; required of all first year students for first two quarters. Presentation and discussion of topics of interest, and the analysis of research in physical education. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: graduate standing; consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

Prerequisite: graduate standing; consent of instructor and Department Chairperson. (S/U grading only.)

Professional Courses

300. The Elementary Physical Education Program

(2) III. Goldbar

Lecture—1 hour; laboratory—2 hours; field trips to selected programs. Prerequisite: senior standing or credential student. Introduction to principles, theories, material, and practices of elementary school physical education program.

380. Methods of Teaching Physical Education (3)

III. Goldbar

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 142 and six units of course 7; or consent of instructor. The methods of teaching group and individual activities for grades K-12; program planning, class management, organization, and evaluation. (P/NP grading only.)

Physical Medicine and Rehabilitation

See Medicine, School of

Physics

(College of Letters and Science)

Barry M. Klein, Ph.D., Chairperson of the Department

Wendell H. Potter, Ph.D., Vice Chairperson of the Department

Department Office, 225 Physics-Geology Building
(916-752-1500)

Faculty

Robert H. Becker, Ph.D., Professor

Franklin P. Brady, Ph.D., Professor

Thomas A. Cahill, Ph.D., Professor

Steven Carlip, Ph.D. Associate Professor

Daniel A. Cebra, Ph.D., Assistant Professor

Ling-Lie Chau, Ph.D., Professor

Lawrence B. Coleman, Ph.D., Professor, *Academic*

Senate Distinguished Teaching Award

Linton R. Corruccini, Ph.D., Professor

James E. Draper, Ph.D., Professor

Glen W. Erickson, Ph.D., Professor
 Charles S. Fadley, Ph.D., Professor
 Ching-Yao Fong, Ph.D., Professor
 Claude Garrod, Ph.D., Professor
 John F. Gunion, Ph.D., Professor
 Tao Han, Ph.D., Assistant Professor
 Joseph E. Kiskis, Ph.D., Professor
 Bary M. Klein, Ph.D., Professor
 Winston T. Ko, Ph.D., Professor
 Richard L. Lander, Ph.D., Professor
 Sudhindra Mani, Ph.D., Associate Professor
 Douglas W. McColm, Ph.D., Senior Lecturer
 David E. Pellett, Ph.D., Professor
 Wendell H. Potter, Ph.D., Senior Lecturer
 Roderick V. Reid, Jr., Ph.D., Associate Professor
 Forest R. Rouse, Ph.D., Assistant Professor
 Richard T. Scalettar, Ph.D., Associate Professor
 Robert N. Shelton, Ph.D., Professor
 Rajiv R.P. Singh, Ph.D., Associate Professor
 David J. Webb, Ph.D., Associate Professor
 Philip M. Yager, Ph.D., Professor
 Xiangdong Zhu, Ph.D., Associate Professor
 Gergely Zimanyi, Ph.D., Associate Professor

Emeriti Faculty

James P. Hurley, Ph.D., Professor Emeritus
 John A. Jungerman, Ph.D., Professor Emeritus
 William J. Knox, Ph.D., Professor Emeritus
 Neal Peek, Ph.D., Senior Lecturer Emeritus
 William W. True, Ph.D., Professor Emeritus

The Major Program

From the smallest subatomic particles to atoms, molecules, stars, and galaxies, the study of physics is the study of what makes the universe tick. Information learned from high-energy particle accelerators and nuclear reactors teaches us not only what holds the nucleus and the atom together but also why stars shine and how radiation therapy fights cancer.

The Program. The Department of Physics offers three degree programs: the Bachelor of Arts in Physics, and the Bachelor of Science in Physics and in Applied Physics. The A.B. degree provides a broad coverage of classical and modern physics while permitting a broader liberal arts education than is possible with the other two programs. The B.S. degree in either Physics or Applied Physics should be followed by the student who plans to enter physics as a profession. The B.S. in Applied Physics provides the student with a solid introduction to a particular applied physics specialty. For the student who plans to enter the job market on completing a B.S. degree, the applied physics orientation would be an asset. Either B.S. program provides a solid foundation in physics for the student interested in graduate work in either pure or applied physics.

Career Alternatives. Careers in physics and applied physics include research and development, either in universities, government laboratories, or industry; teaching in high schools, junior colleges, and universities; management and administration in industrial laboratories and in government agencies; and in production and sales in industry. A major in physics also provides a strong base for graduate-level work in such interdisciplinary areas as chemical physics, biophysics and medical physics, geophysics and environmental physics, astrophysics and astronomy, computer science, and materials science.

Applied Physics

B.S. Major Requirements:

UNITS

Preparatory Subject Matter	56
Physics 9A, 9B, 9C, 9D	16
Mathematics 21A, 21B, 21C, 21D, 22A, 22B	22
Engineering 5 (or equivalent programming course)	3
Chemistry 2A-2B-2C or 2AH-2BH-2CH	15
Any recommended courses for a particular concentration.	
Depth Subject Matter (Common Core)	54

Physics 104A, 104B, 105A, 105AL, 105B, 110A, 110B, 112A, 115A, 116A, 116B, 122A or 122B

At least 18 units from approved courses within one of the following concentrations chosen in consultation with a major adviser

18 Materials science, physical electronics, quantum optics, energy, chemical physics, atmospheric physics, geophysics, physical oceanography. (Lists of approved courses in each concentration with representative programs are available from the Physics Department.)

Total Units for the Major

Physics

A.B. Major Requirements:

UNITS

Preparatory Subject Matter	41
Physics 9A, 9B, 9C, 9D	16
Mathematics 21A, 21B, 21C, 21D, 22A, 22B	22
Engineering 5 (or equivalent programming course)	3
Depth Subject Matter	39
Physics 104A, 104B, 105A, 105AL, 105B, 110A, 110B, 112A, 115A, 122A or 122B	28
At least 7 units from Physics 105BL, 105C, 110C, 112B, 115B, 127, 129A, 129B, 130A, 130B, 140A, 140B	7
At least 4 additional upper division units in physics.	4
Total Units for the Major	80

Recommended

Chemistry 2A-2B-2C or 2AH-2BH-2CH. See also recommended elective courses following the B.S. program below.

Physics

B.S. Major Requirements:

UNITS

Preparatory Subject Matter	56
Physics 9A, 9B, 9C, 9D	16
Mathematics 21A, 21B, 21C, 21D, 22A, 22B	22
Engineering 5 (or equivalent programming course)	3
Chemistry 2A-2B-2C or 2AH-2BH-2CH	15
Depth Subject Matter	54
Physics 104A, 104B, 105A, 105AL, 105B, 110A, 110B, 110C, 112A, 115A, 115B, 122A or 122B	34
At least 10 units from Physics 105BL, 105C, 112B, 127, 129A, 129B, 130A, 130B, 140A, 140B	10
At least 10 additional upper division units from physics. (No more than 6 units in courses numbered 194H, 195, 198, and 199 may be applied in satisfaction of this requirement.)	10
Total Units for the Major	110

Recommended Electives

Astronomy: Astronomy 2.
Computer and numerical analysis: Mathematics 128A or Applied Science Engineering 115.
Statistics: Statistics 131A.
Advanced mathematics: Mathematics 108, 118A-118B, 119A, 119B, 121A-121B, 127A-127B-127C, 185A-185B;
 Physics 10 (history and philosophy of physics). No credit after any other physics course (except 137, 160).

Program Variance. Courses from other departments may be submitted for courses in the depth subject matter requirements by obtaining written permission from the Undergraduate Curriculum Committee chairperson, as approved by the Department.

Major Advisers. Contact Departmental Undergraduate Majors Office, 231 Physics-Geology Building, for adviser assignment.

Minor Program Requirements:

Three distinct minors are offered, all requiring prerequisites equivalent to Mathematics 21A-21B-21C-21D and 22A-22B and Physics 9A-9B-9C-9D. Students considering the possibility of earning a Physics minor should consult with a Physics major adviser before beginning work in one of these minor programs.

UNITS

Physics	18-24
Classical Physics emphasis	23
Physics 104A-104B, 105A, 105AL, 105C, 108, 108L, 110A-110B.	23
(If the fall quarter courses, 104A, 105A, 110A, 112A, are taken in different years, 104A and 105A should be taken in the first year; course 105C does not require 105B.)	

UNITS

Quantum Physics emphasis	22
Physics 104A-104B, 112A, 105A, 105AL, 105B, 115A-115B	22
(Physics 104A-104B and 105A-105B must precede 115A-115B. Physics 110A recommended.)	

UNITS

General Physics emphasis	22
Physics 104A-104B, 105A, 105AL, 105B, 110A, 112A, 115A	22
(Physics 104A-104B and 105A-105B must precede 115A.)	

Graduate Study. The Department of Physics offers programs of study and research leading to the M.S. and Ph.D. degrees and the Ph.D. degree with an Applied Physics Research Specialty. Further information regarding requirements for these three degrees, graduate research, teaching assistantships, and research assistantships may be obtained by writing to the Chairperson, Department of Physics, University of California, Davis 95616.

Astronomy. There is no major program leading to a degree in Astronomy. Introductory courses are offered in general astronomy and astrophysics. Students who wish to use the observatory or the portable telescopes may do so through the Astronomy Club. The graduate program in physics provides research opportunities in radio-astronomy or microwave astrophysics.

Courses in Astronomy (AST)

Lower Division Courses

2. Introduction to Modern Astronomy and Astrophysics (4) I. The Staff

Lecture—3 hours; laboratory/discussion—2 hours. Prerequisite: good facility in high school physics and mathematics (algebra and trigonometry). Description and interpretation of astronomical phenomena using the laws of modern physics. Modern astronomical instrumentation. Gravitation, relativity, electromagnetic radiation, atomic and nuclear processes in relation to the structure and evolution of stars, the solar system, galaxies, and the Universe. Not open to students who have received credit for course 10.

10. General Astronomy (4) III. The Staff

Lecture—3 hours; laboratory/discussion—2 hours. A non-mathematical description of modern astronomy with emphasis on the structure and evolution of stars, galaxies, and the Universe. The Sun and the solar system. Optional topics include pulsars, black holes, quasars, and extra-terrestrial communications. Not open to students who have received credit for course 2 or any physics course (except 10, 137, 160). General Education credit: Nature and Environment.

Courses in Physics (PHY)

Physics 10 is primarily a concept-oriented one-quarter lecture/discussion course requiring relatively little mathematical background.

Physics 1 is a two-quarter sequence requiring some mathematics (trigonometry). Either 1A alone or both

*Course not offered this academic year.

quarters may be taken. The sequence is not intended to satisfy entrance requirements of a year of physics for professional schools, but will satisfy requirements of 3 or 6 units of physics.

Physics 5 is a three-quarter sequence using some calculus (mostly concepts rather than calculations) and including laboratory work as an integral part. The entire sequence is recommended, rather than just 1 or 2 quarters.

Physics 9 is a four-quarter sequence using calculus throughout and including laboratory work as an integral part. The course is designed primarily for students in the physical sciences and engineering.

Note: Faculty listed for each course are well acquainted with the course, but may not teach it this year.

Lower Division Courses

1A. Principles of Physics (3) I. McCole

Lecture—3 hours. Prerequisite: trigonometry or consent of instructor. Mechanics. Introduction to general principles and analytical methods used in physics with emphasis on applications in applied agricultural and biological sciences and in physical education. Not open for credit to students who have completed course 5A or 9A (or former 6A or 8A).

1B. Principles of Physics (3) II. McCole

Lecture—3 hours. Prerequisite: course 1A or 5A (or former 6A); and consent of instructor. Continuation of course 1A. Heat, optics, electricity, modern physics. Not open for credit to students who have completed course 5B, 5C, 9B, 9C, or 9D (or former 6B, 6C or 8B, 8C, 8D).

5A. General Physics (4) I, II. The Staff

Lecture—3 hours; laboratory—2 1/2 hours. Prerequisite: Mathematics 16B (may be taken concurrently). Mechanics and fluids. Introduction to general principles and analytical methods used in physics. Primarily for biological science majors. Students who have had course 6A or 9A (formerly 8A) may not receive credit for 5A. Those who have had course 1A may receive only 2 units of credit.

5B. General Physics (4) II, III. The Staff

Lecture—3 hours; laboratory—2 1/2 hours. Prerequisite: course 5A or 1A with consent of instructor and Mathematics 16B; or Physics 9A (formerly 8A). Continuation of course 5A. Kinetic theory and thermodynamics, wave phenomena, optics. Students who have had course 9B or 6C may not receive credit for course 5B. Those who have had course 1B may receive only three units of credit.

5C. General Physics (4) I, III. The Staff

Lecture—3 hours; laboratory—2 1/2 hours. Prerequisite: course 5B. Continuation of course 5B. Electricity and magnetism, modern physics. Students who have had course 6B or 9C (former 8B) may not receive credit for course 5C. Those who have had course 1B may receive only three units of credit.

9A. Classical Physics (4) III. The Staff

Lecture—3 hours; laboratory—2 1/2 hours; discussion—1 hour. Prerequisite: Mathematics 21B. Mechanics. Introduction to general principles and analytical methods used in physics for physical science and engineering majors. Only two units of credit allowed for students who have completed course 1A. Only one unit of credit allowed for student who have completed course 5A.

9B. Classical Physics (4) I. The Staff

Lecture—3 hours; laboratory—2 1/2 hours; discussion—1 hour. Prerequisite: course 9A or 5A with consent of instructor; Mathematics 21C; Mathematics 21D (may be taken concurrently). Continuation of course 9A. Fluid mechanics, thermodynamics, wave phenomena, optics. Not open for credit to students who have completed Engineering 105A. Only 1 unit of credit allowed to students who have completed course 5B.

9C. Classical Physics (4) II. The Staff

Lecture—3 hours; laboratory—2 1/2 hours; discussion—1 hour. Prerequisite: course 9B; Mathematics 21D; Mathematics 22A (may be taken concurrently). Continuation of course 9B. Electricity and magnetism including circuits and Maxwell's equations. Only one unit allowed to students who have completed course 5C.

9D. Modern Physics (4) III. The Staff

Lecture—3 hours; discussion—1 1/2 hours. Prerequisite: course 9C and Mathematics 22A; Mathematics 22B recommended (may be taken concurrently). Introduction to physics concepts developed since 1900. Special relativity, quantum mechanics, atoms, molecules, condensed matter, nuclear and particle physics. Only two units of credit allowed to students who have completed course 5C.

9HA. Honors Classical Physics (4) III. The Staff

Lecture—3 hours; laboratory—2.5 hours; discussion—1 hour. Prerequisite: high school physics, Mathematics 21A-21B with at least a B+ average (or by recommendation of academic adviser.) Same material as in course 9A, but in greater depth. Only 2 units of credit allowed for students who have completed course 1A or 5A.

9HB. Honors Classical Physics (4) I. The Staff

Lecture—3 hours; laboratory—2.5 hours; discussion—1 hour. Prerequisite: course 9HA (or course 9A with recommendation of course 9A instructor or academic adviser); Mathematics 21C; Mathematics 21D (may be taken concurrently). Continuation of course 9HA. Same material as in course 9B, but in greater depth. Only 2 units of credit allowed for students who have completed course 5B.

9HC. Honors Classical Physics (4) II. The Staff

Lecture—3 hours; laboratory—2.5 hours; discussion—1 hour. Prerequisite: course 9HB (or course 9B with recommendation of course 9B instructor or academic adviser); Mathematics 21D; Mathematics 22A (may be taken concurrently). Continuation of course 9HB. Same material as in course 9C, but in greater depth. Only 2 units of credit allowed for students who have completed course 5C.

9HD. Honors Modern Physics (4) III. The Staff

Lecture—3 hours; discussion—1.5 hours. Prerequisite: course 9HC (or course 9C with recommendation of course 9C instructor or academic adviser); Mathematics 22A; Mathematics 22B (may be taken concurrently). Continuation of course 9HC. Same material as in course 9D but in greater depth. Only 3 units of credit allowed for students who have completed course 5C.

10. Basic Concepts of Physics (4) I, II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra. Survey of basic principles: motion, gravitation, electricity and magnetism, light, relativity, atoms, quanta, nuclei, elementary particles. Includes lecture demonstrations and elementary problem solving. Check with the department office for the emphasis (history/philosophy, energy/environment, natural phenomena, etc.) each quarter. Students who have had any other physics course (except 137, 160) will not receive credit for course 10. General Education credit: Nature and Environment.

90X. Lower Division Seminar (1-2) I, II, III. The Staff

Seminar—1-2 hours. Prerequisite: lower division standing and consent of instructor. Examination of a special topic in Physics through shared readings, discussions, written assignments, or special activities such as laboratory work. May not be repeated for credit. Limited enrollment.

98. Directed Group Study (1-5) I, II, III. The Staff

(Chair person in charge)
Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III.

The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

104A-104B. Introduction to Methods of Mathematical Physics (3-3) I-II. Erickson

Lecture—3 hours. Prerequisite: courses 9B, 9C, 9D and Mathematics 21D, 22A, and 22B passed with grade C- or better; or consent of department; course 104A passed with a grade C- or better or consent of department required for 104B. Elements of vector and tensor analysis, matrix methods, boundary value problems, integral transforms with a applications to physics.

105A-105B. Analytical Mechanics (3-3) I-II. Ko

Lecture—3 hours. Prerequisite: courses 9B, 9C, 9D and Mathematics 21D, 22A, and 22B passed with grade C- or better; or consent of department; course 104A and 105A passed with a grade C- or better or consent of department required for 105B. Principles and applications of Newtonian mechanics; introduction to Lagrange's and Hamilton's equations.

105AL. Computational Laboratory in Mechanics (1) I. Ko

Laboratory—3 hours. Prerequisite: Engineering 5 or the equivalent; course 105A concurrently. Introduction to the application of computers to solving physics problems. Introduction to numerical and graphical methods in mechanics. (P/NP grading only.)

105BL. Computational Laboratory in Mechanics (1) II. Ko

Laboratory—3 hours. Prerequisite: course 105AL; course 105B concurrently. Computer application of numerical and graphical methods in mechanics. (P/NP grading only.)

105C. Continuum Mechanics (3) III. Yager

Lecture—3 hours. Prerequisite: courses 104B and 105A passed with a grade of C- or better, or consent of department. Continuum mechanics.

108. Optics (3) III. Cahill

Lecture—3 hours. Prerequisite: course 9 or 5 sequence and Mathematics 21 sequence or consent of instructor. The phenomena of diffraction, interference, and polarization of light, with applications to current problems in astrophysics, material science, and atmospheric science. Study of modern optical instrumentation. Open to non-majors.

108L. Optics Laboratory (1) III. Cahill

Laboratory—3 hours. Prerequisite: course 108 concurrently. The laboratory will consist of one major project pursued throughout the quarter, based on modern applications of optical techniques.

110A-110B-110C. Electricity and Magnetism (3-3-3) I-II-III. Draper

Lecture—3 hours. Prerequisite: courses 9B, 9C, 9D and Mathematics 21D, 22A, and 22B passed with grade C- or better, or consent of department; prerequisite for 110B is courses 110A and 104A passed with a grade of C- or better or consent of department; prerequisite for course 110C is courses 110B and 104B passed with a grade of C- or better, or consent of department. Theory of electrostatics, electromagnetism, Maxwell's equations, electromagnetic waves.

112A-112B. Thermodynamics and Statistical Mechanics (3-3) I-II. Garrod

Lecture—3 hours. Prerequisite: course 105B or 115A or the equivalent. Introduction to statistical mechanics and thermodynamics.

115A-115B. Introduction to Quantum Mechanics (3-3) III-I. Jungerman

Lecture—3 hours. Prerequisite: for 115A—courses 104B and 105B passed with grade C- or better, or consent of department; for 115B—115A passed with a grade of C- or better, or consent of department. The classical background, basic ideas, and methods of quantum mechanics, with applications to atomic physics.

116A. Electronic Instrumentation (4) II. Pellett

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 9C, Mathematics 22B. An experimental and theoretical study of important electronic circuits commonly used in physics.

116B. Electronic Instrumentation (4) III. Pellett

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 9D, 116A. Continuation of course 116A. Introduction to the use of digital electronics and microcomputers in experimental physics.

121. Foundations of Atomic and Molecular Physics (4) III. McCole

Lecture—3 hours; outside work—9 hours. Prerequisite: course 9D; Mathematics 21C. The phenomena of atomic physics; introduction to quantum phenomena and quantum mechanics; selected topics dealing with atoms, molecules, nuclei, and the solid state.

122A. Advanced Physics Laboratory: Atomic/Solid-State (3) I, II. Webb

Laboratory—8 hours. Prerequisite: course 9D. Experimental techniques and measurements in atomic and solid-state physics; e.g., spectroscopy, optical pumping, magnetic resonance, superconductivity, semiconductors, ferroelectricity. The student performs three to six experiments depending on difficulty. Individual work is stressed.

122B. Advanced Physics Laboratory: Nuclear/High Energy (3) I, II. Lander

Laboratory—8 hours. Prerequisite: course 9D. Similar to course 122A with experiments in gamma-ray coincidence, Mossbauer Effect, Rutherford scattering, muon lifetime, others. Student performs three to six experiments; some of these may be chosen from course 122A.

127. Introduction to Astrophysics (3) III. Becker
Lecture—3 hours. Prerequisite: course 105A. Celestial mechanics, radiation, astrophysical measurements, electromagnetic processes, the sun, binary and variable stars, stellar structure and evolution, galaxies, cosmology. Offered in alternate years.

129A. Introduction to Nuclear Physics (3) I. Brady
Lecture—3 hours. Prerequisite: course 115A. Survey of basic nuclear properties and concepts requiring introductory knowledge of quantum mechanics.

129B. Nuclear Physics (4) II. Brady
Lecture—3 hours; outside work—9 hours. Prerequisite: courses 115B, 129A. Continuation of course 129A.

130A-130B. Elementary Particle Physics (3-4) II-III. Rouse

Lecture—3 hours; term paper required for 130B. Prerequisite: course 115A. Properties and classification of elementary particles and their interactions. Experimental techniques. Conservation laws and symmetries. Strong, electromagnetic, and weak interactions. Introduction to Feynman calculus.

137. Science and Technology of Nuclear Arms Effects and Control (3) I. Jungerman, Craig (Applied Science)

Lecture—3 hours. Prerequisite: upper division standing; one course from courses 1B, 5C, 9D, 10. Scientific and technical aspects of nuclear arms effects and nuclear arms control including nuclear physics of atomic and hydrogen bombs, blast and radiation effects, radioactivity, electromagnetic pulse, ICBM accuracy, laser weapons, verification safeguards, biological and ecological effects. Emphasis on order of magnitude calculations. General Education credit: Contemporary Societies or Nature and Environment. (Same course as Applied Science Engineering 137.)

140A. Introduction to Solid-State Physics (3) II. Zhu

Lecture—3 hours. Prerequisite: course 115A or 9D, and consent of instructor. Survey of basic concepts and classification of experimental phenomena in solids. Crystal structure, phonons, simple metals.

140B. Introduction to Solid-State Physics (4) III. Zhu

Lecture—3 hours; outside work—9 hours. Prerequisite: course 140A. Discussions of the following: energy bands and Fermi surfaces, transport phenomena, semiconductors, ferromagnetism, magnetic resonance.

160. Environmental Physics and Society (3) I. Jungerman

Lecture—3 hours. Prerequisite: course 9D or 5C; or course 10 or 1B and Mathematics 16B or the equivalent. Impact of humankind on the environment will be discussed from the point of view of the physical sciences. Calculations based on physical principles will be made, and the resulting policy implications will be considered. (Same course as Engineering 160.) General Education credit: Contemporary Societies or Nature and Environment.

190X. Upper Division Seminar (1-2) I, II, III. The Staff

Seminar—1-2 hours. Prerequisite: upper division standing and consent of instructor. In-depth examination at an upper division level of a special topic in

Physics. Emphasis on student participation in learning. May *not* be repeated for credit. Limited enrollment.

194HA-194HB. Special Study for Honors Students (4-4) I, II, III. The Staff (Chairperson in charge)

Independent study—12 hours. Prerequisite: consent of instructor required. Open only to Physics and Applied Physics majors who satisfy the College Letters and Science requirements for entrance into the Honors Program. Independent research project at a level significantly beyond that defined by the normal physics curriculum. (Deferred grading only, pending completion of sequence).

195. Senior Thesis (5) I, II, III. The Staff (Chairperson in charge)

Independent study—15 hours. Prerequisite: consent of instructor required. Open only to Physics and Applied Physics majors with senior standing. Preparation of a senior thesis on a topic selected by the student with approval of the department. May be repeated for a total of 15 units.

197T. Tutoring in Physics and Astronomy (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor and department chairperson. Tutoring of students in lower division course. Weekly meetings with instructor. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses**200A. Theory of Mechanics and Electromagnetics** (4) I. Webb

Lecture—3 hours; independent study—1 hour. Prerequisite: courses 104B, 105B, and 110C or the equivalent; course 204A concurrently. Theoretical approaches in classical mechanics including the use of generalized coordinates and virtual work; variational calculus; Lagrange equations; symmetries, conservation laws, and Noether theorem; Lagrangian density; Hamilton formalism; canonical transformations; Poisson brackets; and Hamilton-Jacobi equations.

200B-200C. Theory of Mechanics and Electromagnetics (4-4) II-III. Webb

Lecture—3 hours; independent study—1 hour. Prerequisite: course 200A, and course 204B concurrently. Theoretical approaches in electromagnetics including static electromagnetic fields; Maxwell's equations; plane waves in various media; magnetohydrodynamics; diffraction theory; radiating systems; and special relativity.

204A-204B. Methods of Mathematical Physics (4-4) I-II. Chau

Lecture—3 hours; independent study—1 hour. Prerequisite: courses 104A and 104B or the equivalent. Linear vector spaces, operators and their spectral analysis, complete sets of functions, complex variables, functional analysis, Green's functions, calculus of variations, introduction to numerical analysis.

215A-215B-215C. Quantum Mechanics (4-4-4) I-II-III. Reid

Lecture—3 hours; independent study—1 hour. Prerequisite: course 115B or the equivalent. Formal development and interpretation of non-relativistic quantum mechanics; its application to atomic, nuclear, molecular, and solid-state problems; brief introduction to relativistic quantum mechanics and the Dirac equation.

219A-219B. Statistical Mechanics (4-4) I-II. Singh
Lecture—3 hours; independent study—1 hour. Prerequisite: course 215B or the equivalent. Foundations of thermodynamics and classical and quantum statistical mechanics with applications to properties of solids, real gases, nuclear matter, etc.; fluctuations about the equilibrium state; and phase transitions and critical phenomena.

221. Atomic Physics (3) III. McColm

Lecture—3 hours; seminar—1-2 hours. Prerequisite: course 215A-215B. Term structure of atoms using the angular momentum formalism; methods of computing wave functions and radial integrals; splitting in external fields; term structure in crystals; scattering and collisions. Not offered every year.

223A. Group Theoretical Methods of Physics—Condensed Matter (3) III. Garrod

Lecture—3 hours. Prerequisite: courses 215A, 215B (215C is co-requisite) or consent of instructor. Theory of groups and their representations with applications in condensed matter.

223B. Group Theoretical Methods of Physics—Elementary Particles (3) III. Kiskis

Lecture—3 hours. Prerequisite: courses 215A, 215B (215C is co-requisite) or consent of instructor. Theory of groups and their representations with applications in elementary particle physics.

224A. Nuclear Physics (3) II. Draper

Lecture—3 hours. Prerequisite: course 215B. Comprehensive study of the nucleon-nucleon interaction including the deuteron, nucleon-nucleon scattering, polarization, determination of real parameters of S-matrix, and related topics.

224B. Nuclear Physics (3) III. Draper

Lecture—3 hours. Prerequisite: course 224A. Study of nuclear models, including shell model, collective model, unified model. Energy level spectra, static momenta, and electromagnetic transition rates.

224C. Nuclear Physics (3) I. Draper, Brady

Lecture—3 hours. Prerequisite: course 224B. Study of nuclear scattering and reactions including the optical model and direct interactions. Beta decay and an introduction to weak interactions.

***229A. Advanced Nuclear Theory** (3) II. Brady

Lecture—3 hours. Prerequisite: course 224C. Advanced topics in nuclear theory; theory of quantum-mechanical scattering processes. Exact formal theory and models for two-body scattering. Not offered every year.

***229B. Advanced Nuclear Theory** (3) III. Brady

Lecture—3 hours. Prerequisite: course 229A. Advanced topics in nuclear theory; theory of quantum-mechanical scattering processes. Exact formal theory and models for three-body scattering. Not offered every year.

230A. Quantum Theory of Fields (3) I. Gunion

Lecture—3 hours. Prerequisite: course 215C. Relativistic quantum mechanics of particles; techniques and applications of second quantization; Feynman diagrams; renormalization.

230B. Quantum Theory of Fields (3) II. Carlip

Lecture—3 hours. Prerequisite: course 230A. Continuation of 230A, with selected advanced topics, such as S-matrix theory, dispersion relations, axiomatic formulations.

240A-240B. Solid State Physics (3-3) I-II. Scalettar
Lecture—3 hours. Prerequisite: courses 215A-215B-215C; courses 140A-140B recommended. Introduction to the phenomena and theory of the solid state. Periodic structures, lattice structures, electron states, static properties, electron-electron interaction, electron dynamics, transport properties, optical properties, the Fermi surface, magnetism, superconductivity.

240C-240D. Solid State Physics (3-3) III-I. Zimanyi
Lecture—3 hours. Prerequisite: course 240A-240B or the equivalent. General introduction to many-body techniques as applied in solid state physics.

241. Advanced Topics in Magnetism (3) II. Singh

Lecture—3 hours. Prerequisite: courses 240A-240B, 240C-240D, or consent of instructor. Topics chosen from areas of current research interest. Offered in alternate years.

242. Advanced Topics in Superconductivity (3) II. Scalettar

Lecture—3 hours. Prerequisite: courses 240A-240B, 240C-240D, or consent of instructor. Topics chosen from areas of current research interest. Offered in alternate years.

245A. High-Energy Physics (3) II. Kiskis

Lecture—3 hours. Prerequisite: course 230A. Phenomenology and systematics of strong, electromagnetic, and weak interactions of hadrons and leptons; determination of quantum numbers; quarks and quarkonia; deep inelastic scattering; the quark parton model; experiments at hadron colliders and electron-positron colliders.

245B. High-Energy Physics (3) III. Mani

Lecture—3 hours. Prerequisite: course 245A. Electroweak interactions; phenomenology of the Standard Model of SU(2)_c × U(1); weak interaction experiments; properties of and experiments with W and Z vector bosons; Glashow-Weinberg-Salam model and the Higgs boson; introduction to supersymmetry and other speculations.

245C. High-Energy Physics (3) III. Carlip

Lecture—3 hours. Prerequisite: course 245A. Strong interaction: quantum chromodynamics phenomenology; jets and other experimental tests; quark and gluon distribution functions; quark and gluon scattering; applications of the renormalization group. Not offered every year.

250. Special Topics in Physics (3) I, II, III. The Staff

Lecture—3 hours. Prerequisite: consent of instructor. Topic varies from year to year. May be repeated three times for credit. Not offered every quarter.

252A. Techniques of Experimental Physics (3) III.

The Staff

Lecture—3 hours. Introduction to techniques and methods of designing and executing experiments. Problems and examples from condensed matter research will be utilized.

252B. Techniques of Experimental Physics (3) III.

Mani

Lecture—3 hours. Introduction to techniques and methods of designing and executing experiments. Problems and examples from nuclear and particle research will be utilized.

290. Seminar in Physics (1) I, II, III. The Staff

Seminar—1 hour. Prerequisite: graduate standing in Physics or consent of instructor. Presentation and discussion of topics of current research interest in physics. Topics will vary weekly and will cover a broad spectrum of the active fields of physics research at a level accessible to all physics graduate students. May be repeated for credit. (S/U grading only.)

291. Seminar in Nuclear Physics (1) I, II, III. The Staff

The Staff

Seminar—1 hour. Prerequisite: graduate standing in Physics or consent of instructor. Presentation and discussion of topics of current research interest in nuclear physics. May be repeated for credit. (S/U grading only.)

292. Seminar in Elementary Particle Physics (1) I, II, III. The Staff

The Staff

Seminar—1 hour. Prerequisite: graduate standing in Physics or consent of instructor. Presentation and discussion of topics of current research interest in elementary particle physics. May be repeated for credit. (S/U grading only.)

293. Seminar in Condensed Matter Physics (1) I, II, III. The Staff

The Staff

Seminar—1 hour. Prerequisite: graduate standing in Physics or consent of instructor. Presentation and discussion of topics of current research interest in condensed matter physics. May be repeated for credit. (S/U grading only.)

295. Introduction to Departmental Research (1) I.

The Staff (Chairperson in charge)

Seminar—1 hour. Seminar to introduce first- and second-year physics graduate students to the fields of specialty and research of the Physics staff. (S/U grading only.)

297. Research on the Teaching and Learning of Physics (3) III. Potter

Potter

Seminar—3 hours. Prerequisite: graduate standing in Physics or consent of instructor. Discussion and analysis of recent research in how students construct understanding of physics and other science concepts and the implications of this research for instruction.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

Professional Course**390. Methods of Teaching Physics (1) I, II, III.** The Staff

Lecture/discussion—1 hour. Prerequisite: graduate standing in Physics; consent of instructor. Practical experience in methods and problems related to teaching physics laboratories at the university level, including discussion of teaching techniques, analysis of quizzes and laboratory reports and related topics. Required of all Physics Teaching Assistants. May be repeated for credit. (S/U grading only.)

Physiology

See Biological Sciences: Section of Neurobiology, Physiology and Behavior; Human Physiology (Medicine, School of); and Plant Physiology

Physiology (A Graduate Group)

James H. Jones, Ph.D., Chairperson of the Group
Group Office, 188 Briggs Hall (916-752-9092)

Faculty. Consists of more than 70 faculty members drawn from 23 departments in the College of Agriculture and Environmental Sciences, the College of Letters and Science, the School of Medicine, and the School of Veterinary Medicine.

Graduate Study. The Graduate Group in Physiology offers programs of study and research leading to the M.S. and Ph.D. degrees and participates in joint Ph.D./M.D. and Ph.D./D.V.M. programs. The programs emphasize broad training in the fundamental principles of physiology and in-depth specialization in cardiorespiratory, cellular, comparative, endocrine, reproductive, exercise, metabolic, neuro-, systemic and domestic animal physiology. For information regarding these programs, address the Program Staff Person at the above location.

Graduate Advisers. J.M. Horowitz (*Neurobiology, Physiology and Behavior*), J. Roser (*Animal Science*), and E.P. Steffey (*Surgical and Radiological Sciences*).

Graduate Admissions Officer. T. Adams (*Animal Science*).

Courses in Physiology (PGG)

Graduate Courses

200L. Animal Cell Culture Laboratory (4) II. B. Wilson

Wilson

Discussion—2 hours; laboratory—6 hours. Prerequisite: courses in undergraduate biochemistry, cell biology, or general physiology, or consent of instructor. Techniques of cell culture, with emphases on cell physiology and the actions of drugs and toxicants on cultured somatic cells. Design, performance and interpretation of experiments with animal cells in vitro.

210A-210B-210C. Advanced Physiology (6-6-6) I-II-III. Jones

Jones

Lecture—5 hours; discussion—1 hour. Prerequisite: graduate student in the Physiology Graduate Group Ph.D. program, or consent of instructor. Advanced

course on general principles of physiology, surveying homeostasis, cellular, neurophysiology, cardiovascular, respiratory, renal, endocrine, gastrointestinal, metabolic, reproductive, exercise, comparative, environmental and integrative physiology.

213. Principles of Electronics for Biologists (2) III.

Horowitz, Scobey

Lecture—1 hour; laboratory—3 hours. Prerequisite: Physics 5A, 5B, 5C, and Mathematics 16A, 16B, 16C or the equivalent. Principles of electronics applied to biological measurements. Focuses on interconnection of laboratory instruments including filters and computers. Topics covered include: RC networks; operational amplifiers; digital gates; computer interfacing; and programming.

214. Neurophysiology (4) II. Carstens

Lecture—4 hours. Prerequisite: Neurobiology, Physiology and Behavior 111B, 112; consent of instructor. Electrical activity of neurons and neuroeffector junctions; physiology of the nervous system as studied by its electrical activity.

215. Neurophysiology Laboratory (3) III. Horowitz, Scobey

Scobey

Discussion—3 hours; laboratory—9 hours. Prerequisite: course 214 (may be taken concurrently). Selected experiments based on modern concepts to illustrate in depth, surgical techniques, stimulating and recording techniques used in neurophysiology research.

***216. Neurophysiology Literature (2) I.** Pappone

Lecture—1 hour; discussion—1 hour. Lectures covering experimental and theoretical methods in studying cell membrane ion channels and the resulting characterization of the physiological functions and structure/function relationships of some of the most important channel types. Discussion of classical and current original papers.

217. The Vertebrate Eye (2) II. Sillman

Sillman

Seminar—1 hour; lecture/discussion—1 hour. Prerequisite: graduate standing and a background in biology; Neurobiology, Physiology and Behavior 120F strongly recommended. Physiology, biochemistry, and biology of the vertebrate eye with emphasis on the retina, particularly photoreceptors. A comparative approach will be taken with adaptations in ocular function related to behavior and environment. May be repeated for credit with consent of instructor. Offered in alternate years.

218. Topics in Circulatory Pathophysiology (3) II.

Weidner

Lecture—1 hour; discussion—2 hours. Prerequisite: graduate standing. Selected topic in circulatory or cardiopulmonary physiology will be addressed each offering. Topics will include pathophysiology. Lecture and discussion based on current research literature in the field. May be repeated with consent of instructor. Offered in alternate years.

219. Muscle Growth and Development (3) II. R. Carlsen (Human Physiology)

Carlsen (Human Physiology)

Lecture—2 hours; seminar—1 hour. Prerequisite: Biological Sciences 103, Biological Sciences 104 or Molecular and Cellular Biology 150, or consent of instructor. Integration of growth and development of skeletal muscle; morphology, biochemistry, neural control mechanisms, circulatory and nutritional factors. Prenatal and neonatal differentiation of fiber types. Experimental and hereditary myopathies. Offered in alternate years.

220. General and Comparative Physiology of Reproduction (3) I. Anderson (Animal Science), Lasley (Reproduction)

Lasley (Reproduction)

Lecture—3 hours. Prerequisite: Neurobiology, Physiology and Behavior 110, 110L; Biological Sciences 101, 103. Basic phenomena of sexual and asexual reproduction and comparisons of processes in a wide variety of animals; gamete formation, structure, and metabolism; fertilization; neuroendocrine mechanisms in maturation and reproductive cycles; behavioral aspects.

222. Mammalian Gametogenesis and Fertilization (3) II. Berger

Berger

Lecture/discussion—3 hours. Prerequisite: Neurobiology, Physiology and Behavior 121 or equivalent.

Course will emphasize our current understanding of events in mammalian gametogenesis and the fertilization process. Published results, conclusions drawn from these results, and their contribution to our understanding will be discussed.

230. Advanced Endocrinology (2) II. Moberg
Lecture—2 hours. Prerequisite: Neurobiology, Physiology and Behavior 130 or the equivalent, and graduate standing. Focus on timely topic of endocrine research. Critical review of current literature and discussion of future research strategies in the area. May be repeated for credit when topic differs.

231. Neuroendocrinology (3) II. Woolley
Lecture—3 hours. Prerequisite: Neurobiology, Physiology and Behavior 110 or the equivalent course in systemic physiology; Neurobiology, Physiology and Behavior 130 or the equivalent course in endocrinology. Neural-endocrine interactions; neural regulation of the endocrine system, especially in relation to reproduction; the role of hormones and growth factors in sexual differentiation of the brain.

234. Neurophysiological Basis of Neurotoxicology (3) I. Woolley
Lecture—3 hours. Prerequisite: Neurobiology, Physiology and Behavior 110 or the equivalent; basic understanding of neurophysiology. Mechanisms of action at the cellular and systemic level of a number of different neurotoxins and toxicants. Examples of ways toxins may act on the nervous system and techniques for study of neurotoxicology. (Same course as Environmental Toxicology 234.)

242. Biological Rhythms (3) I. Fuller
Lecture—2 hours; lecture/discussion—1 hour. Prerequisite: Neurobiology, Physiology and Behavior 110 or the equivalent. General aspects and basic mechanisms of biological rhythms; the importance of rhythm desynchronization in areas of pharmacology and space medicine; telemetry; mathematical methods; chronometry; daily, reproductive, and annual periods; shift-work, jet lag and sleep disorders. Offered in alternate years.

***275. Neurohumoral Regulatory Mechanisms of Thermogenesis (3) II.** Horwitz
Lecture—2 hours; discussion—1 hour. Prerequisite: Biological Sciences 104 or the equivalent; Biological Sciences 102 or the equivalent; consent of instructor. Designed for graduate and advanced undergraduate students, this course will examine thermogenic systems in homeotherms (primarily mammals) with respect to regulation (hormonal and central nervous control) and effector mechanisms (basis of heat generation at the target cell).

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Discussion and critical evaluation of advanced topics and current trends in research. (S/U grading only.)

290C. Research Conference in Physiology (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Presentation and discussion of faculty and graduate student research in physiology. May be repeated for credit. (S/U grading only.)

291A. Selected Topics in Visual Science (2) III. Chalupa (Psychology), Johnson (Ophthalmology), Scobey (Neurology), Sillman
Seminar—2 hours. Prerequisite: graduate student standing and consent of instructor; course 217 recommended. Vision from the standpoint of physiology, biochemistry, morphology and psychophysics. Consideration of all levels of the visual system from periphery to highest brain centers. Emphasis on recent research. Topics vary each year. May be repeated for credit. (S/U grading only.)

291B. Seminar in Cellular Mechanisms of Adaptation (1) I, II, III. Horwitz
Discussion—0.5 hour; seminar—0.5 hour. Prerequisite: Neurobiology, Physiology and Behavior 100B; Biological Sciences 103, consent of instructor. Review and evaluation of current literature and research in cellular adaptations to the environment. May be repeated for credit when a different topic is studied. (S/U grading only.)

291D. Research Approaches in Physiology (2) I.

The Staff (Chairperson in charge)
Seminar—2 hours. Prerequisite: graduate standing in Graduate Group in Physiology or consent of instructor. Current research in physiology. Overall design of experiments and particular research areas. (S/U grading only.)

293. Current Progress in Physiology (1) I, II, III.

The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Seminars presented by guest lecturers describing their current research activities. May be repeated for credit. (S/U grading only.)

297T. Tutoring in Physiology (3) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour; tutorial—2 hours. Prerequisite: completion of course to be tutored (with a grade of A) and consent of instructor. Advanced study of systemic physiology through leading small discussion groups in upper division courses (students are required to attend lectures in the course which they are tutoring). May be repeated for credit by tutoring in different courses or in the continuation of a course (e.g., courses 112, 113, 114). (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

300A-300B. Pedagogical Aspects of Physiology in Higher Education (3-3) I, II, III. The Staff (Chairperson in charge)

Lecture, discussion, or laboratory, or combination. Prerequisite: meet qualifications for teaching assistant in physiology. Participation as a teaching assistant for one quarter in a designated physiology course. Instruction in methods of leading discussion groups, leading laboratory sections, writing and grading quizzes, operation and use of laboratory equipment, and reading and grading laboratory reports. Course meets teaching requirements for Ph.D. program in Physiology. (S/U grading only.)

390. The Teaching of Physiology (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: Teaching Assistant assignment to a physiology lecture course and consent of instructor. Practical experience in methods and problems of teaching physiology lecture courses. May include analyses of texts and supporting material, discussion of teaching techniques, preparing for and conducting discussion sessions, and formulation of topics and questions for examination under supervision of instructor. May be repeated for credit. (S/U grading only.)

Plant Biology

See Biological Sciences: Section of Plant Biology; and Plant Biology (A Graduate Group)

Plant Biology (A Graduate Group)

Judy Jernstedt, Ph.D., Chairperson of the Group
Group Office, 152 Robbins Hall (916-752-7094/ FAX 916-752-5410)

Faculty. Includes 100 faculty members from fifteen departments in the field of plant biology.

Graduate Study. The Graduate Group in Plant Biology offers programs of study and research leading to the M.S. and Ph.D. degrees. The program is designed to prepare students for careers in teaching and research at colleges and universities, government or industrial laboratories. The graduate curriculum involves both a broad overview of the discipline and in-depth study and research in one of four areas of specialization: cell and molecular biology; ecology, systematics, and evolution; integrative plant and crop physiology; and plant development and structure. These areas of specialization permit individual study and research into diverse aspects of plant biology, including anatomy, biochemistry, cell biology, cytology, developmental biology, ecology, genetics, molecular biology, morphology, paleobotany, population biology, systematics, and weed science.

Preparation. For both the M.S. and Ph.D. programs, a level of scholastic development equivalent to a Bachelor's degree in biological sciences from a recognized college or university is required. Courses in the following areas are considered to be prerequisite to the advanced degrees in Plant Biology: inorganic chemistry, organic chemistry, introductory physics, genetics, structural botany, biochemistry, introductory plant physiology, introductory plant physiology laboratory, calculus, introductory statistics, plant ecology/systematics/evolution, genetics, and plant cell/molecular biology. Limited deficiencies can be made up after admission. The graduate adviser, the major professor, and the student will design a program of advanced courses to meet individual academic needs within one of the specializations.

Graduate Adviser. Contact the Group office.

Courses in Plant Biology (PBI)

Graduate Courses

***201. Plant Senescence: Cellular and Molecular Aspects (4) II.** Bennett (Vegetable Crops), Huffaker (Agronomy and Range Science), Labavitch (Pomology), Romani (Pomology), Yang (Vegetable Crops)
Lecture—4 hours. Prerequisite: Plant Biology 111, 112; Biological Sciences 102 and 103. Cellular and molecular phenomena associated with the senescence of plants and plant parts. Emphasis on principles and mechanisms. Offered in alternate years.

202. Advanced Physiology of Cultivated Plants (2) I. Sachs (Environmental Horticulture), Labavitch (Pomology)
Lecture—1 hour; discussion—1 hour. Prerequisite: Plant Science 101 and 102; Plant Biology 111, 112. Selected physiological topics generally focusing on source-sink behavior affecting crop production and quality. Offered in alternate years. (P/NP grading only.)

***205A. Advanced Plant Physiology (3) III.** Lucas
Lecture—3 hours. Prerequisite: Plant Biology 112; Chemistry 107A or consent of instructor. Cellular physiology, plant water relations, translocation and membrane transport.

205B. Advanced Plant Physiology (3) II. Stemler, Theg
Lecture/discussion—3 hours. Prerequisite: Plant Biology 111, 112, and Biological Sciences 103. Photosynthesis, photophosphorylation, chloroplast metabolism and biology. Offered in alternate years.

***205C. Advanced Plant Physiology (3) I.** The Staff
Lecture—3 hours. Prerequisite: Plant Biology 112, Biological Sciences 102; courses 205A, 205B and Biological Sciences 103 recommended. Internal and environmental regulation of plant growth and development.

***206A. Advanced Plant Physiology Laboratory (3) III.** Lucas
Laboratory—6 hours; term paper. Prerequisite: course 205A (may be taken concurrently). Laboratory procedures in plant physiology. Experiments demonstrate the theory and practice of modern instrumentation, and are designed to illustrate subject matter of course 205A.

***206B. Advanced Plant Physiology Laboratory (3) Laboratory—9 hours.** Prerequisite: course 205B (may

be taken concurrently); Molecular and Cellular Biology 120L. Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 205B.

***206C. Advanced Plant Physiology Laboratory (3) I.** The Staff

Laboratory—9 hours. Prerequisite: course 205C (may be taken concurrently). Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 205C.

208. Plant Hormones and Regulators (4) II. Labavitch (Pomology)

Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Biology 112. Chemistry, biochemistry and physiological activity of major classes of natural plant growth regulators. Primary consideration given to concepts that are of current research interest. Growth regulators in agriculture. Offered in alternate years.

***210. Plant Ecophysiology (3) II.** Pearcy
Lecture—3 hours. Prerequisite: Plant Biology 111, 112, 117. Study of the mechanisms of physiological adaptation of plants to their environment. Offered in alternate years.

***211. Ecophysiological Methods (3) III.** Pearcy
Lecture—1 hour; laboratory—4 hours; individual project; one Saturday field trip to be arranged. Prerequisite: Plant Biology 111, 117, and consent of instructor. A laboratory and lecture course covering basic concepts underlying the research methods and instrumentation useful in plant ecophysiology.

***212. Physiology of Herbicidal Action (3) II.** Bayer
Lecture—3 hours. Prerequisite: Plant Biology 112, 122. Study of the fundamental processes involved in the physiological action of herbicides. Detailed consideration of the fate of herbicides in plants.

214. Higher Plant Cell Walls (3) I. Labavitch (Pomology), Nevins (Vegetable Crops)
Lecture—2 hours; discussion—1 hour. Prerequisite: Plant Biology 112, a course in biochemistry. Lectures focus on the structure, analysis, synthesis, and development-related metabolism of cell walls. Discussions center on analysis of scientific papers related to lecture topics. Offered in alternate years.

***215. Light and Plant Growth (3) II.** Bonner
Lecture—3 hours. Prerequisite: courses 205A, 205B, 205C; Physics 5B. Mechanisms and phenomena involved in the control of plant growth by light. Photoperiodism, photomorphogenesis, phototropism, and certain aspects of photosynthesis. Course offered in alternate years.

216. Advanced Topics in Mineral Nutrition (4) III. Lãuchli (Land, Air and Water Resources)
Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Biology 135 or consent of instructor. Cellular compartmentation of mineral elements, new methods and results; selected topics in absorption, translocation, metabolism and function of mineral elements; nutrition and transport in plants adapted to special nutrient environments. Offered in alternate years.

217. Membrane Biology of Plants (3) III. Bennett, Lucas (Vegetable Crops)
Lecture—2 hours; discussion—1 hour. Prerequisite: Plant Biology 112 and Biological Sciences 103, or consent of instructor. Structure, biogenesis, and function of plant cell membranes. Emphasis will be placed on the molecular basis of plant membrane functions and on the role of membranes in selected physiological processes. Offered in alternate years.

***218A. Advanced Concepts in Plant Cell Biology: Cell Biogenesis (3) III.** Bennett, Theg
Lecture/discussion—3 hours. Prerequisite: Biological Sciences 102, 103. Survey of molecular mechanisms underlying structural and functional differentiation of plant cell subcellular compartments. Topics include membrane and protein biosynthesis, protein targeting, and turnover, and regulation of nuclear and organellar gene expression as related to the biogenesis of plant cell organelles. Offered in alternate years.

218B. Advanced Concepts in Plant Cell Biology: Signal Transduction and Intercellular Communication (3) III. Bennet, Lucas
Lecture—3 hours. Prerequisite: Biological Sciences

102, 103 or consent of instructor. Intracellular signal transduction pathways in the plant cells as well as longer term, adaptive responses which involve signals transmitted between plant cells. Weekly lectures and student-led discussions on current literature. Offered in alternate years.

220. Plant Developmental Biology (4) III. Rost, Jernstedt, Silk
Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: plant anatomy, physiology, and biochemistry. A survey of the concepts of plant development and organization. Examines plant cells, tissues, and organs with special emphasis on experimental evidence for mechanisms regulating developmental processes.

***221. Special Topics in Plant Physiology (2) III.** The Staff
Discussion—1 hour; seminar—1 hour. Analysis in depth of recent advances in plant physiology. Lectures and discussions by research specialists. Term paper integrating and analyzing lectures required. May be repeated for credit. (S/U grading only.)

***222. Special Topics in Plant Morphology, Systematics, and Ecology (2) II.** The Staff
Seminar—2 hours. Analysis of recent advances in plant structure and evolution. Lectures and discussions by research specialists. Term paper integrating and analyzing lectures required. May be repeated once for credit. (S/U grading only.) Offered in alternate years.

227. Plant Molecular Biology (4) I. Harada
Lecture/discussion—4 hours. Prerequisite: Molecular and Cellular Biology 121 or 161. Molecular aspects of higher plant biology with emphasis on gene expression. Plant nuclear and organelle genome organization, gene structure, mechanisms of gene regulation, gene transfer, and special topics related to development and response to biological and environmental stimuli.

228. Plant Molecular Biology Laboratory (5) II. Harada, Bennett (Vegetable Crops)
Lecture—2 hours; laboratory—10 hours. Prerequisite: Molecular and Cellular Biology 120L, a course in molecular genetics and consent of instructors. Research methods in plant molecular biology. Topics include analysis of gene expression, characterization of gene structure, and gene transfer technology. Emphasis will be placed on analysis of developmentally regulated gene expression. (Same course as Vegetable Crops 228.)

***229. Molecular Biology of Plant Reproduction (3) II.** O'Neill
Lecture—3 hours. Molecular genetic basis of plant reproduction. Emphasis on understanding developmentally regulated gene expression as it relates to the major changes that occur during plant reproduction and on the genetic control of flowering. Offered in alternate years.

231. Biological Electron Microscopy (1) I. Falk
Lecture—1 hour. Prerequisite: consent of instructor. Introduction to biological microscopy. Areas covered are: electron optics, electron specimen interactions, and vacuum systems.

231L. Biological Electron Microscopy Laboratory (3) I. Falk
Laboratory—9 hours. Prerequisite: consent of instructor; course 231 (may be taken concurrently). Introduction to biological electron microscopy. Areas covered are: specimen preparation and microscope operation. Limited enrollment.

233. Biological Nitrogen Fixation (3) II. Phillips
Lecture—2 hours; seminar—1 hour. Relationship between fundamental and applied nitrogen-fixation research in biochemistry, genetics, physiology, microbiology, and ecology with overall emphasis on increasing agronomic productivity. Former course Agronomy 233.

***255. Principles of Plant Taxonomy (4) I.**
Lecture—2 hours; laboratory—6 hours. Prerequisite: Plant Biology 108; Evolution and Ecology 100 recommended. Principles of plant taxonomy; phylogenetic vs. phenetic classification; examples of the way in

which various disciplines—anatomy, embryology, biochemistry, etc.—elucidate problems of taxonomic relationship, mainly of genera and higher categories.

***256A. Experimental Plant Taxonomy (2) II.** Kyhos
Lecture—1 hour; laboratory—3 hours. Prerequisite: Plant Biology 108; Plant Biology 117 and Evolution and Ecology 100 recommended. Application of experimental techniques to the elucidation of taxonomic problems and evolutionary relationships in higher plants. Offered in alternate years.

***256B. Experimental Plant Taxonomy (2) III.** Kyhos
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 256A. Continuation of course 256A. Study of variation in natural populations in relation to taxonomy; the application of population sample analysis, cytogenetics, transplant studies, etc., to the solution of taxonomic problems and the clarification of relationships. Offered in alternate years.

290A. Faculty Seminar (1) I. The Staff
Seminar—1 hour. Seminars presented by members of Plant Biology faculty describing their areas of research. Required of all beginning students in the Plant Biology Graduate Group. (S/U grading only.)

290B. Seminar (1) I, II, III. The Staff
Seminars presented by visiting scientists on research topics of current interest. (S/U grading only.)

290C. Research Conference in Botany (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: graduate standing and/or consent of instructor. Presentation and discussion by faculty and graduate students of research projects in botany. May be repeated for credit. (S/U grading only.)

291. Graduate Student Seminar in Plant Biology (1) II, III. The Staff
Seminar—1 hour. Prerequisite: graduate student standing. Student-given seminars on topics in plant biology, with critiques by instructor and peers. How to give a seminar, including preparation of visual and other teaching aids. Topics determined by instructor in charge. May be repeated for credit. (S/U grading only.)

292. Seminars in Plant Biology (1) II. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. Review of current literature in botanical disciplines. Disciplines and special subjects to be announced quarterly. Students present and analyze assigned topics. May be repeated for credit. (S/U grading only.)

295. Seminar in Mycology (1) I. Butler (Plant Pathology)
Seminar—1 hour. Review and evaluation of current literature and research in mycology. (S/U grading only.) (Same course as Plant Pathology 295.)

297T. Tutoring in Plant Biology (1-5) I, II, III. The Staff
Tutorial—3-15 hours. Offers graduate students, particularly those not serving as teaching assistants, the opportunity to gain teaching experience. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
Prerequisite: graduate standing.

299. Research (1-12) I, II, III. The Staff
Prerequisite: graduate standing. (S/U grading only.)

Professional Course

390. The Teaching of Plant Biology (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: graduate standing; concurrent appointment as a teaching assistant in Plant Biology. Consideration of the problems of teaching botany, especially of preparing for and conducting discussions, guiding student laboratory work, and the formulation of questions and topics for examinations. (S/U grading only.)

Professional Course

***401. Functioning as a Professional Beyond UCD (2) I.** Phillips
Lecture/discussion—1 hour; seminar—1 hour. Prerequisite: graduate standing as M.S. or Ph.D. candidate. Students will develop a letter of application, a curriculum vitae, a statement of teaching and/or

research interest, and a job interview seminar for a position advertised in their area of professional specialization. Group discussions will provide constructive suggestions for strengthening individual presentations. Offered in alternate years. (S/U grading only.) Former course Agronomy 401.

Plant Pathology

(College of Agricultural and Environmental Sciences)

James J. Marois, Ph.D., Chairperson of the Department

Department Office, 354 Hutchison Hall
(916-752-0300)

Faculty

Richard M. Bostock, Ph.D., Professor
George Bruening, Ph.D., Professor
Michael R. Davis, Ph.D., Lecturer
John M. Duniway, Ph.D., Professor
Bryce W. Falk, Ph.D., Professor
Robert L. Gilbertson, Ph.D., Assistant Professor
David G. Gilchrist, Ph.D., Professor
Deborah A. Golino, Ph.D., Lecturer
W. Douglas Gubler, Ph.D., Lecturer
Clarence I. Kado, Ph.D., Professor
Bruce Kirkpatrick, Ph.D., Associate Professor
James D. MacDonald, Ph.D., Professor (*Plant Pathology, Environmental Horticulture*)
James J. Marois, Ph.D., Professor
Srecko John M. Mircetich, Ph.D., Lecturer
Pamela C. Ronald, Ph.D., Assistant Professor
Brett M. Tyler, Ph.D., Associate Professor
Jerry K. Uyemoto, Ph.D., Lecturer
Ariena H.C. van Bruggen, Ph.D., Associate Professor
Robert K. Webster, Ph.D., Professor

Emeriti Faculty

Edward E. Butler, Ph.D., Professor Emeritus
Robert N. Campbell, Ph.D., Professor Emeritus
James E. DeVay, Ph.D., Professor Emeritus
W. Harley English, Ph.D., Professor Emeritus
Raymond G. Grogan, Ph.D., Professor Emeritus
William B. Hewitt, Ph.D., Professor Emeritus
Bert Lear, Ph.D., Professor Emeritus
George Nyland, Ph.D., Professor Emeritus
Joseph M. Ogawa, Ph.D., Professor Emeritus

Related Major Program. See the major in Plant Science.

Graduate Study. The Department of Plant Pathology offers programs of study and research leading to the M.S. and Ph.D. degrees. Information can be obtained from the graduate adviser. See also the Graduate Studies section in this catalog.

Graduate Advisers. B. Kirkpatrick, J.D. MacDonald, B.M. Tyler, A.H.C. van Bruggen.

Courses in Plant Pathology (PLP)

Upper Division Courses

120. Introduction to Plant Pathology (4) I. Gilbertson, Falk; III. The Staff
Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1C; Microbiology 2 recommended. The nature, cause, and control of plant diseases.

125. Diagnosis and Control of Plant Diseases (4) III. MacDonald
Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: course 120. Clinical plant pathology with emphasis on diagnosis, epidemiology, and control of diseases of economic plants. Students may specialize in diseases of fruits, vegetables, field crops, or ornamentals in the laboratory exercises. Offered in alternate years.

130. Physiology of Fungi (3) I. Gilchrist, Bostock
Lecture—3 hours. Prerequisite: Biological Sciences 1C; Biological Sciences 103 and Plant Biology 119

recommended. Discussion of the nature and interrelationships of fungal cell structure, growth, spore germination, nutrition, and metabolism with emphasis on responses of fungi to environmental changes. Selected examples of beneficial and destructive roles of fungi will also be considered. Offered in alternate years.

140. Agricultural Biotechnology, Ethics and Public Policy (4) III. Marois, Jolly (Agricultural Economics)

Lecture—3 hours; term paper or discussion—1 hour. Examination of agricultural biotechnology within a moral/ethical framework. Public policy development and implementation. General Education credit: Nature and Environment.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: course 120 and consent of instructor. Work experience off and on campus, supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

205A-205B. Diseases of Vegetable and Field Crops (3-1) III-Extra-session summer. van Bruggen
Lecture—2 hours; laboratory—3 hours; fieldwork—6 hours; research term paper. Prerequisite: course 120; Plant Biology 119 or course 125. Study of vegetable and field crops with emphasis on diagnosis, epidemiology, and control. Lectures on diagnostic techniques, seed pathology, disease assessment and crop loss, and integrated pest management. Field trips and laboratory exercises related to disease diagnosis. (Deferred grading only, pending completion of sequence.)

206A-206B. Diseases of Fruit, Nut, and Vine Crops (3-1) III-Extra-session summer. Kirkpatrick
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 120; Plant Biology 119. Clinical study of fruit, nut, and vine crops diseases with emphasis on etiology, epidemiology, diagnosis, and control. (Deferred grading only, pending completion of sequence.) Course 205 may be taken concurrently.

208. Ecology of Plant Pathogens and Epidemiology of Plant Diseases (4) II. Duniway
Lecture—3 hours; discussion—1 hour. Prerequisite: course 120 or the equivalent. Interaction between higher plants, plant pathogens, and the environment which is important in the occurrence and severity of plant disease. Emphasis is placed on the population dynamics and ecology of plant pathogens in the aerial and soil environment. Offered in alternate years.

209. Principles of Plant Disease Control (3) II. Webster
Lecture—3 hours. Prerequisite: course 120 or the equivalent. Discussion of the underlying principles and methods used for the control of plant diseases. Emphasis placed on application of epidemiological principles, biological (including host resistance), and chemical strategies to achieve disease control. Offered in alternate years.

210. Physiology and Biochemistry of Host-Pathogen Interaction (4) I. Gilchrist, Bostock
Lecture—3 hours; discussion—1 hour. Prerequisite: course 130 or the equivalent; Biological Sciences 103. Discussion of the nature of host-pathogen interactions, metabolic alterations in plant disease, biochemistry of disease resistance, toxins in plant disease. Offered in alternate years.

215X. Genetics and Molecular Biology of Plant Pathogens (4) II. Tyler
Lecture—3 hours; laboratory/discussion—3 hours. Prerequisite: course 120 and Biological Sciences 101. Genetic analysis of pathogenicity, cultivar-specificity, and host-specificity in plant pathogens, particularly fungi; application of molecular biology to the isolation and characterization of the genes involved; and to

aspects of pathogen identification; emphasis on research techniques and problem-solving. Offered in alternate years.

217. Molecular Genetics of Fungi (3) II. Holland, Tyler
Lecture—3 hours. Prerequisite: graduate standing in a biological science, Biological Sciences 101, 103, Molecular and Cellular Biology 161, Plant Biology 119, courses 130, 215X; Microbiology 215 recommended. Advanced treatment of molecular biology and genetics of filamentous fungi and yeasts, including gene structure, organization and regulation; plant pathogenesis; secretion; control of reproduction; molecular evolution; transformation; and gene manipulation. Offered in alternate years. (Same course as Biological Chemistry 217.)

224. Pathogenic Fungi (5) III. The Staff
Lecture—3 hours; laboratory—6 hours. Prerequisite: Plant Biology 119. Morphology and taxonomy of plant pathogenic fungi.

226. Plant Virology (5) II. Bruening, Falk
Lecture—2 hours; laboratory—9 hours. Prerequisite: consent of instructor. Viruses as causal agents of plant diseases; chemical and physical properties of viruses; methods of transmission; procedures for assay and diagnosis; multiplication of viruses; pathological cytology and anatomy; application of equipment and techniques used in research. Offered in alternate years.

228. Plant Bacteriology (5) I. Kirkpatrick
Lecture—2 hours; laboratory—9 hours. Prerequisite: course 120; Microbiology 2 or the equivalent; Biological Sciences 102, 103. Study of bacteria which have a saprophytic, symbiotic, or parasitic association with higher and lower plants. Clinical and molecular methods for identification and classification of these bacteria.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Review and evaluation of current research in plant pathology. (S/U grading only.)

290C. Advanced Research Conference (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: course 120 or consent of instructor. Presentation, evaluation, and critical discussions of research activities in the area of advanced plant pathology; primarily designed for graduate students. (S/U grading only.)

291. Seminar in Host-Parasite Physiology (1) I, II. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: course 120. Review and evaluation of current literature and research in host-parasite physiology. (S/U grading only.)

292. Seminar in Plant Virology (1) III. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: course 226. Review and evaluation of current literature and research in virology. (S/U grading only.)

293. Seminar on Soil Microbiology and Root Disease (1) II. VanBruggen, Duniway
Seminar—1 hour. Prerequisite: course 120. One of the students or faculty members introduces a topic based on one or more papers read by the students, and then leads the discussion on this topic. (S/U grading only.)

294. Seminar on Plant Epidemiology (1) I. van Bruggen, Marois
Seminar—1 hour. Prerequisite: course 120. One of the students or faculty members introduces a topic, based on one more papers on plant epidemiology read by the participants, and then leads the discussion on this topic. (S/U grading only.)

295. Seminar in Mycology (1) I, III. The Staff (Chairperson in charge)
Seminar—1 hour. Review and evaluation of current literature and research in mycology. (S/U grading only.) (Same course as Plant Biology 295.)

298. Special Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Plant Physiology

See Biological Sciences: Section of Plant Biology; and Plant Biology (A Graduate Group)

Plant Protection and Pest Management (A Graduate Group)

Lester E. Ehler, Ph.D., Chairperson of the Group
Group Office, 367 Briggs Hall (916-752-0475)

Faculty. Includes faculty members from the Colleges of Agricultural and Environmental Sciences, and Letters and Science.

Graduate Study. The Graduate Group in Plant Protection and Pest Management offers programs of study and research leading to the M.S. degree. Students may conduct independent research or participate in on-going projects on integrated crop management and sustainable agriculture. Weeds, insects, plant pathogens, nematodes, rodents, and other pests are treated as parts of complex ecosystems and not as isolated problems. Courses include: concepts and systems of plant protection and pest management; diagnosis and control of plant pest problems; toxicology and legal ramifications; and equipment for chemical applications. Detailed information can be obtained from the Group Chairperson and the application for Graduate Admission and Fellowship.

Graduate Adviser. R.F. Norris (*Plant Biology*).

Courses in Plant Protection and Pest Management (PPP)

Graduate Courses

201. Concepts and Systems of Plant Protection and Pest Management (4) II. Marois (*Plant Pathology*)

Lecture—2 hours; discussion—1 hour; laboratory—2 hours. Prerequisite: Agricultural Systems and Environment 120, Entomology 110, Plant Pathology 120, Plant Biology 120 (may be taken concurrently), Nematology 100; Plant Biology 117 or Evolution and Ecology 101 recommended. Ecological perspectives of agricultural systems, the role of pests and pest management in these systems, and the monitoring and modeling of the systems.

202A-202B. Diagnosis of Plant Pest Problems and the Control of Causal Agents (4-4) I. Norris (*Plant Biology*), III. Rosenheim (*Entomology*)

Discussion—1 hour; fieldwork—9 hours. Prerequisite: Entomology 110, Plant Pathology 120, Plant Biology 120, Nematology 100 (may be taken concurrently). Problems and assessment of losses caused by insects, pathogens, weeds, nematodes, and other pests. Methods of determining infestation levels and establishing economic thresholds, and control of these pests with emphasis on integration of available management practices into programs.

290. Seminar (1-2) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III, summer. The Staff (Chairperson in charge)
(S/U grading only.)

Plant Science

(College of Agricultural and Environmental Sciences)

Faculty. Faculty in the Departments of Agronomy and Range Science; Environmental Horticulture; Land, Air and Water Resources; Plant Pathology; Pomology; Vegetable Crops; and Viticulture and Enology contribute to teaching courses in the plant science area.

Related Major Programs. Plant Science courses fulfill requirements in several majors, including Agricultural Systems and Environment, Biological Sciences, Environmental and Resource Sciences, International Agricultural Development, and Plant Biology.

Admission Into the Plant Science Major is temporarily closed for the academic year 1994-95. Students should refer to the major programs listed above.

The Major Program

The plant science major trains students in the biological and natural sciences as they apply to the production, protection, and maintenance of crop plants, and their quality following harvest.

The Program. Students majoring in plant science spend the first two years of study developing the scientific and general background necessary for upper-division work. The science courses include chemistry, biology, botany, physics, and mathematics. General background is provided by course offerings in the social science/humanities area (English, rhetoric, and economics) and by courses in areas supportive of plant science, such as entomology (the study of insects), weed science, genetics, water science, plant pathology (plant diseases), and plant physiology (plant processes and functions). At the upper division level, students may choose to specialize in one of the seven departmentally associated options or may choose general education by electing the general Plant Science option.

Internships and Career Alternatives. Internships are available with local seed companies in farm production, and in extension work with farm advisers. For graduates, job opportunities exist in nursery and greenhouse management, farming, technical, and sales positions in agricultural businesses and associated enterprises, such as banking and equipment and supply companies, as well as in private, state, and federal service in consulting and research.

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses may be taken with your adviser's approval. *Courses shown without parentheses are required.*)

	UNITS
English Composition Requirement	3-11
See College requirement	0-8
Additional English (English 102 in plant science or related area, or English 104).....	1-3
Preparatory Subject Matter	59-61
Computer science (Agricultural Science and Management 21).....	3
Economics (Economics 1A or 1B).....	5
Physics (Physics 1A-1B).....	6
General chemistry (Chemistry 2A-2B).....	10
Organic chemistry (Chemistry 8A-8B).....	6
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Plant science (Plant Science 2).....	5
Mathematics (Mathematics 16A-16B).....	6
Depth Subject Matter	36-37
Statistics (Agricultural Science and Management 150).....	4
Soil science (Soil Science 100).....	4
Weed science (Botany 120).....	3
Entomology (Entomology 110 or 115).....	4
Plant pathology (Plant Pathology 120).....	4
Plant physiology (Botany 111, 112).....	6

Genetics (Genetics 100).....	4
Water science (Water Science 104 or 110).....	3-4
Plant nutrition (Botany/Plant Science 135 or Soil Science 109).....	4

Select one of the following eight options.....**38-49**

Agronomy Option

Specific course requirements.....	20-21
Agronomy 100, 100L.....	5
Agronomy 111, 112, 113 (any two courses).....	7-8
Plant Science 101.....	4
Soil Science 109.....	4

Additional courses to be selected with consent of the adviser from the following.....**24-25**

Agricultural Economics 130, 140, 150;	
Agricultural Engineering Technology 103, 104AT, 105; Agricultural Practices 49, 149; Animal Science 2, 114, 116; Atmospheric Science 105; Nematology 100, 110; Plant Pathology 125; Plant Science 102, 103, 113; Soil Science 102, 120, 150; Water Science 103, 110, 172.	

Courses offered in other production departments (e.g., Vegetable Crops, Pomology, Viticulture and Enology, etc.) or in Range Science may be selected in consultation with adviser to satisfy specific individual goals.

Natural sciences electives, not to exceed 8 units, may also be included.

Floriculture/Nursery Management Option

Specific course requirements.....	27
Environmental Horticulture 6, 105, 120, 125, 133.....	19
Plant Science 102, 109.....	8

Additional courses to be selected with consent of the adviser from the following.....**18**

Agricultural Economics 18, 112, 113;	
Agricultural Engineering Technology 114; Agronomy 100; Botany 105, 111L; Economics 11A, 11B; Environmental Horticulture 107, 130; Geography 3; Landscape Architecture 40, 131, 155; Microbiology 3; Plant Pathology 125; Plant Science 101, 112, 112L, 113; Pomology 102; Psychology 144; Soil Science 109; Vegetable Crops 101; Viticulture and Enology 101B, 110, 116.	

Courses offered in the natural sciences may be selected in consultation with adviser.

Landscape Horticulture Option

Specific course requirements.....	30
Environmental Horticulture 6, 105, 120, 130, 133.....	17
Landscape Architecture 40, 131, 155.....	9
Plant Science 102.....	4

Additional courses to be selected with consent of the adviser from the following.....**15**

Agricultural Economics 18, 112, Agronomy 100; Botany 105; Economics 11A, 11B; Environmental Horticulture 107, 125; Geography 3; Landscape Architecture 111; Plant Pathology 125; Plant Science 101, 109, 113; Pomology 101; Soil Science 109; Vegetable Crops 101; Wildlife and Fisheries Biology 10.	
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Courses offered in the natural sciences may be selected in consultation with adviser.

Plant Pathology Option

Specific course requirements.....	40
Biochemistry 101A, 101B.....	6
Botany 105, 119.....	10
Chemistry 1C, 5.....	9
Microbiology 2, 3.....	4
Nematology 100.....	4
Plant Pathology 125, 130.....	7

Plant Science Option

Specific course requirements	46-49
Plant science (Plant Science 101, 102, 109, 113, 122)	11
Agricultural economics (Agricultural Economics 18, 113, 120, 130, 140, 150)	3-5
Agronomy (Agronomy 100, 100L)	5
Environmental horticulture (Environmental Horticulture 6, 105, 125, 130)	3-4
Pomology (Pomology 101, 102)	4
Vegetable crops (Vegetable Crops 101)	4
Viticulture (Viticulture 2)	2
Biochemistry (Biochemistry 101A, 101B)	6
Environmental toxicology (Environmental Toxicology 101)	4
Soils (Soil Science 109)	4

Pomology Option

Specific course requirements	15
Pomology 101, 102	8
Plant Science 109, 112	7

Additional courses to be selected with consent of the adviser from the following

Agricultural Economics 112, 140; Agricultural Engineering Technology 101AT; Agronomy 100, 100L; Atmospheric Science 105; Entomology 119, 119L; International Agricultural Development 101; Nematology 100, 110; Plant Pathology 125, 130; Plant Science 101, 102, 112, 112L, 113; Pomology 103; Soil Science 102, 109, 120, 150; Vegetable Crops 101, 118; Viticulture and Enology 110, 116; Water Science 110.	30
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Natural sciences electives, not to exceed 8 units, may also be included.

Vegetable Crops Option

Specific course requirements	19
Vegetable Crops 101, 105, 150	12
Plant Science 102, 112	7

Additional units selected with consent of adviser from the following

Agricultural Economics 130; Biochemistry 101A, 101B, 122; International Agricultural Development 110A, 110B, 141; Plant Pathology 125; Plant Science 101, 103, 112L, 113, 122, 126, 135, 196, 270; Soil Science 109; Vegetable Crops 118, 195; one unit of seminar to be selected with consent of adviser in subject matter area of specialization; 2 units of 190 or 198 or 9 units of 199 may be applied toward requirement. A Senior Thesis option is available.	19
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Natural sciences electives, not to exceed 8 units, may also be included.

Viticulture Option

Specific course requirements	34-35
Biochemistry 101A, 101B	6
Plant Science 101, 102, 109	12
Viticulture and Enology 2, 101A, 101B, 101C, 110 or 111, 115 or 116, 118	16-17

Additional courses to be selected with consent of the adviser from the following

Agricultural Economics 18, 140, 150; Agricultural Engineering Technology 101AT; Agricultural Practices 49, 149; Atmospheric Sciences 105; Biochemistry 122; Nematology 100, 110; Plant Pathology 125; Plant Physiology 208; Plant Science 103, 112, 112L, 113, 122, 202; Soil Science 102, 109, 150; Viticulture and Enology 110, 111, 210, 216, 217, 219; Water Science 103, 110, 172.	10-11
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Natural sciences electives, not to exceed 8 units, may also be included.

Unrestricted Electives

0-30

Total Units for the Major

180

Major Adviser. D. Rains.

Advising Center for the major is located in 137 Hunt Hall (916-752-1715).

Related Courses. See under Agronomy, Environmental Horticulture, Plant Pathology, Pomology, Vegetable Crops, and Viticulture and Enology.

Courses in Plant Science (PLS)

Questions pertaining to the following courses should be directed to the instructor.

Lower Division Courses**1. Plants for Garden, Orchard and Landscape (2)**

I, III. The Staff

Lecture—1 hour; laboratory—3 hours. For non-majors. Hands-on experience with plants cultivated for food, environmental enhancement and personal satisfaction. Topics include establishing a vegetable garden, pruning and propagating trees and vines, growing flowers and ornamental plants, and the role of plants in human health and well being. Not open for credit to students who have completed Agricultural Systems and Environment 2.

10. Plants and People (3) I. Bradford; II. Bennett, Michelmore; III. Nevins (Vegetable Crops) Lecture—3 hours. Prerequisite: high school biology. Plants as a resource for food, recreation, and environmental enhancement. Emphasis on how our relationship to plants has changed through history and how the growth and development of plants affect their utility. General Education credit: Nature and Environment.

90X. Plant Science Seminar (1-4) I, II, III. The Staff Prerequisite: consent of instructor. Examination of a special topic in a small group setting.

92. Plant Science Internship (1-6) I, II, III, summer. The Staff

Internship—3-18 hours. Prerequisite: consent of instructor. Work experience off or on campus in all subject areas pertaining to plant science. Internships supervised by a member of the faculty. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Rains (Agronomy and Range Science) in charge) Prerequisite: lower division standing. (P/NP grading only.)

Upper Division Courses

101. Ecology of Crop Systems (4) I. Denison (Agronomy and Range Science)

Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Systems and Environment 2 and Soil Science 100, or consent of instructor. Ecological processes governing the structure and behavior of managed ecosystems. Emphasis on mechanistic and systems views of the physical environment, photosynthetic productivity, competition, adaptation, nutrient cycling, energy relations and contemporary issues such as climate change.

103. Evolution of Crop Plants (3) II. The Staff Lecture—3 hours. Prerequisite: course 10, Biological Sciences 101. Diversity and domestication of economic plants; principles of plant evolution; centers of origin, genetic diversity and germ plasm collections; implications in new agricultural developments; bioethical issues in relation to genetic resources.

104. Conservation of Plant Genetic Resources (3) I. Bliss

Lecture—3 hours. Prerequisite: Molecular and Cellular Biology 10 or Biological Sciences 10. Biological, social and ethical issues involved in plant genetic resources will be studied beginning with their historical importance to human welfare and covering germplasm utilization, property rights and strategies for conservation, both on an international and personal scale. General Education credit: Nature and Environment.

105. Plant Genetics (4) I. Wilkins (Agronomy and Range Science)

Lecture—3 hours; discussion/laboratory—1 hour. Pre-

requisite: Biological Sciences 1A or consent of instructor. Basic principles of transmission genetics, cytogenetics, population and quantitative genetics, and molecular genetics. Practical aspects of genetic crosses and analysis of segregating populations.

***107. Plant Cell, Tissue, and Organ Culture (4)** II.

Burger (Environmental Horticulture), Sutter (Pomology) Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Plant Biology 111, 112 (may be taken concurrently); or consent of instructors. Basic and applied aspects of plant tissue culture including media preparation, micropropagation, embryogenesis, anther culture, protoplast culture and transformation. Offered in alternate years.

109. Plant Propagation (4) II. Sutter (Pomology) Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Agricultural Systems and Environment 2 or Biological Sciences 1C. Principles and practices of propagating plants covering anatomical, physiological, and practical aspects.

110. Rhizosphere Ecology (2) III. Phillips Lecture—2 hours. Prerequisite: Agricultural Systems and Environment 2 or Biological Sciences 1A-1B-1C. Plant-microbe interactions affect plant growth, soil formation, and agricultural sustainability. Course addresses physical, chemical and biological processes which occur at the surface of plant roots. Evolution and modification of the biochemical and genetic bases of rhizosphere ecology are discussed.

112. Postharvest Physiology and Handling of Horticultural Commodities (3) I. Kader (Pomology), Reid (Environmental Horticulture), Saltveit (Vegetable Crops)

Lecture—3 hours. Prerequisite: general plant science background recommended (e.g., Agricultural Systems and Environment 2, course 10 or Food Science and Technology 2); concurrent enrollment in course 112L recommended. Physiological processes related to the maturation and senescence of fruits, vegetables, and ornamentals; fundamentals involved in handling, transportation, storage, and marketing practices, e.g., temperature and humidity control, protective treatments, controlled atmospheres.

112L. Postharvest Physiology and Handling

Laboratory (2) I. Kader, Saltveit

Discussion—1 hour; laboratory—3 hours. Prerequisite: course 112 (may be taken concurrently). Demonstrations and exercises following the subject matter of course 112.

113. Plant Breeding (4) I. St. Clair (Vegetable Crops)

Lecture—3 hours; demonstration-discussion—2-3 hours. Prerequisite: Biological Sciences 101 (may be taken concurrently). The principles of plant breeding applied to economic crops.

114. Biology, Evolution and Systematics in Vegetables (3) I. The Staff

Lecture—2 hours; laboratory—3 hours; one or more field trips; written and oral reports. Prerequisite: upper division standing, Agricultural Systems and Environment 2. Taxonomic and horticultural classification of the more important vegetable cultivars, their origin, morphology, nomenclature, and description; wild vegetable species, minor and exotic vegetables and trends in development of new cultivars. Not open for credit to students who have completed Vegetable Crops 105.

115. Biological Applications in Pomology (2) II.

DeJong

Lecture—1 hour; laboratory—3 hours. Prerequisite: Biological Sciences 1C or consent of instructor. Physiology, growth, development and environmental requirements of fruit trees and cultural practices used to maintain them. Course emphasis is on the application of biological principles in the culture of commercially important temperate zone fruit tree species. Not open for credit to students who have completed Pomology 101.

116. Principles of Fruit Production (4) III. Weinbaum, Gradziel

Lecture—3 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1C; course 115 recommended. Principles underlying cultural practices associated

with fruit and nut production, including morphology and physiology of the developing buds, flowers and fruits. Emphasis on commercially important temperate zone species. Not open for credit to students who have completed Pomology 102.

***122. Physiological Genetics of Crop Plants (3) I.** Jones (Vegetable Crops)

Lecture—3 hours. Prerequisite: Biological Sciences 101; Plant Biology 111, 112; or consent of instructor. Principles and recent advances in the physiological genetics of plants. Plant developmental processes related to yield will be considered at several levels; genetic control, biochemical regulation and the impact of the environment on development of plants. Offered in alternate years.

126. Physiology of Environmental Stresses in Plants (3) II. Richards, Silk, L'äuchli (Land, Air and Water Resources)

Lecture—2 hours; discussion—1 hour. Prerequisite: Plant Biology 112 (may be taken concurrently) or the equivalent. Principles and selected topics in physiology of environmental stresses in plants. Areas emphasized are general stress concepts, physiological responses of plants to selected environmental stresses and integration of stresses.

135. Mineral Nutrition of Plants (4) III. Richards (Land, Air, and Water Resources), Brown (Pomology) Lecture—3 hours; laboratory—3 hours. Prerequisite: Plant Biology 111 or the equivalent. Evolution and scope of plant nutrition; essential and other elements; mechanisms of absorption and translocation; mineral metabolism; deficiencies and toxicities; genetic and ecological aspects of plant nutrition. (Same course as Plant Biology 135.)

140. Principles of Plant Biotechnology (3) II. Danker (Pomology)

Lecture—3 hours. Prerequisite: Biological Sciences 1A and 101. Principles and concepts of plant biotechnology including recombinant DNA technology, plant molecular biology, plant cell and tissue culture, and crop improvement.

145. Applied Plant Biology (4) II. Brown (Pomology), Napoli (Environmental Horticulture), Rains (Agronomy and Range Science)

Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Biology 111, and Biological Sciences 101 or course 105. Advanced concepts of plant biology with reference to the uses of plants for food, fiber, and environmental enhancement. Current research, applications, and issues in crop improvement, production and biotechnology will be presented and discussed.

191. Undergraduate Research: Proposal (3) I. The Staff

Lecture—1 hour; discussion—1 hour; independent study—3 hours. Prerequisite: upper division standing and consent of instructor. A faculty sponsor will individually assist each student to define a problem, conduct a literature survey, identify objectives, generate testable hypotheses, design experiments, plan data analysis, prepare a working outline, and write and revise a draft proposal. Not open for credit to students who have completed Vegetable Crops 191. (P/NP grading only.)

191L. Undergraduate Research: Experiment (1-5) I. The Staff

Laboratory—3-15 hours. Prerequisite: course 191 (may be taken concurrently) and consent of instructor. Experimental testing of the hypothesis developed in course 191. May be repeated for credit. Not open for credit to students who have completed Vegetable Crops 191L. (P/NP grading only.)

192. Internship (1-12) I, II, III, summer. The Staff (Rains (Agronomy and Range Science) in charge) Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off or on campus in all subject areas pertaining to Plant Science. Internships supervised by a member of the faculty. (P/NP grading only.)

194H. Senior Honors Thesis (1) I, II, III. The Staff Independent study—3 hours. Prerequisite: course 191L and consent of thesis adviser. Preparation and submission of honors thesis and presentation of the results in a seminar. Not open for credit to students who have completed Vegetable Crops 194H. (P/NP grading only.)

196. Postharvest Technology of Horticultural Crops (3) III. Kader (Pomology) in charge

Lecture/discussion/demonstration—5 days; field trip—5 days. Prerequisite: upper division or graduate student standing. Intensive study of current procedures for postharvest handling of fruits, nuts, vegetables, and ornamentals in California. Scheduled first two weeks immediately following last day of spring quarter. Considered a spring course for pre-enrollment. (P/NP grading only.)

197T. Tutoring in Plant Science (1-4) I, II, III. The Staff (Rains (Agronomy and Range Science) in charge)

Prerequisite: upper division standing; completion of course being tutored or the equivalent. Leading discussion sections, conducting laboratory exercises or proctoring in personalized-system-of-instruction-format classes under faculty guidance. May be repeated once for credit if different course is tutored. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Rains (Agronomy and Range Science) in charge) Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

221A-221B. Applied Crop Physiology (4-4) III. The Staff

Lecture—1 hour; seminar—1 hour; laboratory—6 hours. Prerequisite: course 101 or Plant Biology 111, 112 or consent of instructor. Research methods in applied plant physiology with examples drawn primarily from agronomic and vegetable crops. Field and laboratory projects, data reduction, and preparation of suitable reports.

224. Water in Physiology and Ecology of Plants (4) II. Hsiao

Lecture—3 hours; discussion—1 hour. Prerequisite: course 124, or Plant Biology 111 and 117, or consent of instructor. Evapotranspiration and energy balance; water and component potentials; water transport to, within, and from plants; dynamics and regulation of water status; drought resistance; responses to water deficits and salinity; water use efficiency; adaptation to aridity; productivity in relation to water.

***270. Reproductive Biology of Flowering Plants (3) I.** Wu (Environmental Horticulture)

Lecture—2 hours; discussion—1 hour. Prerequisite: Plant Biology 111 and Biological Sciences 101. Fundamental mechanisms of reproductive biology of flowering plants and their influence on genetic variation, evolution, and cultural practices. Offered in alternate years.

291. Seminar in Postharvest Biology (1) I, II, III.

Salveit (Vegetable Crops) in charge Discussion—1 hour. Prerequisite: consent of the instructor; open to advanced undergraduates. Intensive study of selected topics in the postharvest biology of fruits, vegetables and ornamentals. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff

To be arranged.

Political Science

(College of Letters and Science)

Larry Berman, Ph.D., Chairperson of the Department
Department Office, 227 Voorhies Hall (916-752-0966)

Faculty

Donna L. Bahry, Ph.D., Professor
Larry Berman, Ph.D., Professor
Edmond Costantini, Ph.D., Professor
Scott S. Gartner, Ph.D., Assistant Professor
John B. Gates, Ph.D., Associate Professor
Emily O. Goldman, Ph.D., Assistant Professor
Stuart L. Hill, Ph.D., Associate Professor
Robert W. Jackman, Ph.D., Professor
Scott C. James, Acting Assistant Professor
Bruce W. Jentleson, Ph.D., Associate Professor
Jeannette Money, Ph.D., Assistant Professor
Miroslav Nincic, Ph.D. Professor
Larry I. Peterman, Ph.D., Professor
Donald S. Rothchild, Ph.D., Professor
Gary M. Segura, Ph.D., Assistant Professor
Richard Sinopoli, Ph.D., Associate Professor
Randolph M. Siverson, Ph.D., Professor
Andrew Skalaban, Ph.D., Assistant Professor
James F. Spriggs II, Acting Assistant Professor
Larry L. Wade, Ph.D., Professor
Geoffrey A. Wandersforde-Smith, Ph.D., Associate Professor (*Political Science, Environmental Studies*)

Emeriti Faculty

Richard W. Gable, Ph.D., Professor Emeritus
Alexander J. Groth, Ph.D., Professor Emeritus
Charles M. Hardin, Ph.D., Professor Emeritus
Clyde E. Jacobs, Ph.D., Professor Emeritus
Joyce K. Kallgren, Ph.D., Professor Emeritus
Lloyd D. Musolf, Ph.D., Professor Emeritus
John R. Owens, Ph.D., Professor Emeritus
Marvin Zetterbaum, Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award*
Paul E. Zinner, Ph.D., Professor Emeritus

The Major Programs

Political science is the study of politics and political systems at the local, national, and international levels. It concerns not only the institutions of government but also the analysis of such phenomena as political behavior, political values, political change and stability, parties, pressure groups, bureaucracies, administrative behavior, justice, national security, and international affairs.

The Program. The Department of Political Science offers two major programs: political science and political science—public service. The political science major aims to provide the student with a broad understanding of political concepts, political institutions, political behavior, and political processes. The political science—public service major is designed for students who desire opportunities for practical hands-on experience in their major. It differs in particular from the political science major in its internship requirement and its focus on the American political system.

Internships and Career Alternatives. The proximity of UC Davis to the state capital affords exceptional internship possibilities in local, state, and national government offices, providing students with actual experience in politics and government service while still attending school. A student who majors in political science acquires research and analytic skills relevant to many professional fields. Consequently, the majors offered in political science are valuable not only in providing students with a better understanding of politics and political systems, but also as a first step toward careers in teaching, law, management, government, urban planning, journalism, politics, administration, or for graduate studies in numerous fields.

Plastic Surgery

See Medicine, School of

Political Science

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	20
Political Science 1	4
Two courses from Political Science 2, 3, 4, 5, 7	8
(Course 7 may not be taken if course 5 is taken.)	
Two courses from History 3, 4A, 4B, 4C, 10, 11A, 11B, 11C, 12A, 12B, 12C, 13A, 13B, 13C, 133, 134A, 134B, 145, 146A, 146B, 147A, 147B, 147C, 151A, 151B, 151C, 151D.....	8
Depth Subject Matter	36
Select two courses in each of three fields, listed below. The fields must be chosen from at least two Groups, A, B, or C.....	
<i>Group A</i>	
Field (1) Political theory: Political Science 111–119, 187	
<i>Group B</i>	
Field (2) American government and institutions: Political Science 100–109, 171, 173–175, 180–189, 191, 195	
Field (3) Parties and political behavior: Political Science 160–170	
Field (4) Public law: Political Science 150–156	
<i>Group C</i>	
Field (5) Comparative government: Political Science 126, 140–149, 177–179	
Field (6) International relations: Political Science 120–139	
Additional upper division units in political science to achieve a total of 36.....	12
Only 5 units of Political Science 192 (internship) may be counted towards the 36-unit requirement; and Political Science 192A, 192B, or 192W may not be counted toward a field requirement.	
Total Units for the Major	56

Political Science—Public Service

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	12
One course from Political Science 1, 5, or 7...4	
Two courses from Political Science 2, 3, or 4	8
Recommended: Economics 1A-1B.	
Depth Subject Matter	48
Core program	12
Two courses chosen from Political Science 100, 104, 105, 106, 113, 180, 181; and one course from Political Science 108, 109, 111, 114.	
Internship, Political Science 192A, 192B, or 192W	10
Research paper, Political Science 193.....	2
Fields of concentration.....	24
Select six upper division courses from two or three fields of concentration listed below with at least two courses in each field selected; at least 16 of the units must be in political science. (Core Program courses may not be counted toward this requirement.)	
Fields of Concentration	
(1) <i>Policy formulation:</i> Political Science 103, 105, 106, 108, 109, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 173, 174, 175, 195; Economics 130.	
(2) <i>Policy implementation and evaluation:</i> Political Science 156, 180, 181, 182, 183, 187, 188, 189; Economics 131	
(3) <i>Policy interpretation—Substance and procedures (public/pre-law):</i> Political Science 150, 151, 152, 153, 155, 156.	

- (4) *Policy areas:*
- a) Urban policy and implementation: Political Science 100, 101, 102, 191, Economics 125, Environmental Biology and Management 110, Environmental Studies 162, 173.
 - b) Environmental policy and implementation: Political Science 107, Economics 123, Environmental Studies 160, 161, 166, 168A-168B, 179.
 - c) Environmental policy and implementation: open field that might include courses relevant to health care, welfare, education, community development, transportation, science and technology, etc. (requires approval of Political Science-Public Service adviser).

Total Units for the Major

Major Advisers. Consult Departmental Office.

Minor Program Requirements:

Students electing a minor in Political Science may choose one of two plans:

	UNITS
Political Science	24
<i>Plan I:</i> Upper division units in political science (may include 4 units of lower division course work) distributed among at least two of the three Groups, A, B, and C, or	
<i>Plan II:</i> a 24-unit plan approved by a faculty adviser. Five units of internship may count toward the minor.	

Teacher Credential Subject Representative. Consult Departmental Office. See also the section on the Teacher Education Program.

Graduate Study. The Department offers programs of graduate study and research leading to the M.A. and Ph.D. degrees. Information concerning admission to these programs and requirements for completion are available in the department office.

Graduate Adviser. Consult Departmental Office.

Public Affairs Internship Program. This program is open to upper division students in any major who want to obtain an internship in the area of government and public service. Information and applications are available from the Intern Coordinator, Political Science Department, 226 Voorhies Hall, 752-1989.

American History and Institutions. This University requirement may be satisfied by passing any one of the following Political Science courses: 1, 5, 100, 101, 102, 103, 104, 105, 106, 108, 109, 113, 130, 131, 160, 163. (See also under University requirements.)

Courses in Political Science (POL)

Lower Division Courses

- 1. American National Government (4) I.** Hill; II. Costantini; III. Berman
Lecture—3 hours; discussion—1 hour. Survey of American national government, including the constitutional system, political culture, parties, elections, the presidency, Congress, and the courts. General Education credit: Contemporary Societies.
- 2. Introduction to Comparative Politics (4) I.** The Staff
Lecture—3 hours; discussion—1 hour. Introduction to basic concepts in political analysis and application of them in comparative studies of selected countries. Coverage is given to cultural and other informal dimensions of politics as well as to more formal political and governmental structures. General Education credit: Contemporary Societies.
- 3. International Relations (4) I.** Nincic; II. Siverson; III. Goldman
Lecture—3 hours; discussion—1 hour. International conflict and cooperation, including the Cold War, nuclear weapons, and new techniques for understanding international politics.

4. Basic Concepts in Political Theory (4) II.

Sinopoli
Lecture—3 hours; discussion—1 hour. Analysis of such concepts as the individual, community, liberty, equality, justice, and natural law as developed in the works of the major political philosophers. General Education credit: Civilization and Culture.

5. Contemporary Problems of the American Political System (4) III. James

Lecture—3 hours; discussion—1 hour. In-depth treatment of selected problems and issues of American politics, governmental institutions, and policies.

7. Contemporary Issues in Law and Politics (4) II. Spriggs

Seminar—4 hours. A seminar which focuses on the political dimensions of American law and institutions. Examines the role of courts in resolving contemporary issues of law and politics including abortion, capital punishment, and civil rights. Limited enrollment. Open to students having no more than 40.1 units.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Local Government and Politics (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing or consent of instructor. Politics and government of local communities in the United States, including cities, counties, and special districts. Emphasizes sources and varieties of community conflict, legislative and executive patterns, expertise, decision making, and the politics of structure. Observation of local governing boards.

101. Urban Political Economy (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or consent of instructor. Historical development of urban political economies. Focuses on ways in which different groups have tried to use local government authority to achieve their objectives and why they succeeded or failed.

102. Urban Public Policy (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Political and economic relationships among central cities, suburbs, and regional, state, and federal governments. Focuses upon policy areas such as poverty, transportation, welfare, and housing, and upon who governs and who benefits from the policies in these areas.

***103. American Federalism (4) I.** The Staff
Lecture—3 hours; research paper. Prerequisite: course 1 or 5 recommended. American politics and policy in the context of national-state-local relations. Constitutional roots of Federalism, centralizing and decentralizing tendencies, fiscal relations, current policy issues, and management of intergovernmental programs.

104. California State Government and Politics (4) II. The Staff
Lecture—3 hours; research paper. The California political system. Political culture, constitution, elections and parties, direct democracy, legislature, governor, executive branch, courts, finances, state-local relations, and policy issues.

105. The Legislative Process (4) III. Segura
Lecture—3 hours; discussion—1 hour. Analysis of the legislative process with emphasis on the United States Congress; legislative organization and procedures, legislative leadership and policy making, legislators and constituents, relations between Congress and other agencies.

106. The Presidency (4) II. James; III. Berman
Lecture—3 hours; discussion—1 hour; optional term paper. The American presidency's origins and development; presidential power and influence as manifested in relationships with Congress, courts, parties, and the public in the formulation and administration of foreign and domestic policy; nominations, campaigns, and elections.

*Course not offered this academic year.

107. Environmental Politics and Administration

(4) I. Wandesforde-Smith
Lecture—3 hours; discussion—1 hour. Introduction to the environment as a political issue in the United States and to the development of administrative mechanisms for handling environmental problems. Changing role of Congress, the presidency, the bureaucracy, and the courts in environmental policy formulation and implementation.

108. Policy Making in the Public Sector (4) III.

Skalaban

Lecture—3 hours; research paper. The theoretical rationale for governmental activity, program evaluation, PPBS, positive theories of policy making, the quantitative study of policy determinants, implementation, and proposals for improved decision making.

109. Public Policy and the Governmental Process

(4) III. Wade

Lecture—3 hours; research paper. The processes of formulating public policy, including individual and collective decision making, political exchange, competition, bargaining, coalition formation and the allocation of public goods, resources and opportunities.

111. Systematic Political Science (4) II. Jackman

Lecture/discussion—4 hours. Philosophical basis of modern political science; major specific approaches; selected concepts relevant to modern political concerns; and research design and execution.

112. Contemporary Democratic Theory (4) II.

Wade

Lecture—3 hours; discussion—1 hour. Major contemporary attempts to reformulate traditional democratic theory; attempts to replace traditional theory by conceptual models derived from modern social science findings. Offered in alternate years.

113. American Political Thought (4) II. Sinopoli

Lecture—3 hours; term paper. Prerequisite: upper division standing in Political Science or consent of instructor. Origins and nature of American political thought. Principles of American thought as they emerge from the founding period to the present.

114. Quantitative Analysis of Political Data (4) III.

Skalaban

Lecture—3 hours; term paper. Logic and methods of analyzing quantitative political data. Topics covered include central tendency, probability, correlation, and non-parametric statistics. Particular emphasis will be placed on understanding the use of statistics in political science research. Offered in alternate years.

115. Medieval Political Thought (4) I. Peterman

Lecture—3 hours; term paper. Prerequisite: course 118A. Examination of the ideas central to medieval political thinking. Emphasis will be upon the thoughts of the major political thinkers of the period, rather than upon political history.

***116. Foundations of Political Thought: A Study in Depth of a Major Political Philosopher** (4) II.

Peterman

Lecture/discussion—3 hours; term paper. Intensive analysis and evaluation of the seminal works of a major political philosopher.

***117. Marxism** (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Examination of the political and social philosophy of Karl Marx, with reference to the evolution of Marxism in the nineteenth and twentieth centuries.

118A. History of Political Theory (4) I. Peterman

Lecture—3 hours; term paper. Critical analyses of the works of major political philosophers. Classical and medieval political philosophy—Plato, Aristotle, Cicero, St. Thomas.

118B. History of Political Theory (4) II. Peterman

Lecture—3 hours; special assignments. Critical analyses of the works of major political philosophers. Modern political philosophy—Machiavelli, Hobbes, Locke, Rousseau, Burke.

118C. History of Political Theory (4) III. Sinopoli

Lecture—3 hours; term paper. Critical analyses of the works of major political philosophers. Nineteenth and twentieth centuries: Hegel, Tocqueville, Mill, Marx, Nietzsche, Sartre.

***119. Modern Political Thought** (4) III. The Staff

Lecture—3 hours; term paper. Prerequisite: upper division standing in Political Science or consent of instructor. Study in depth of philosophers considered central to modern political thought, especially nineteenth and twentieth century political thought. Emphasis will be upon an individual philosopher or concept rather than upon a survey of modern political thought.

120. Theories of International Politics (4) I. Siverson;

II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 recommended. An analysis of political processes involved in the initiation, conduct, and termination of modern international warfare.

121. War (4) II. Siverson

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 recommended. An analysis of political processes involved in the initiation, conduct, and termination of modern international warfare.

122. International Law (4) III. Wandesforde-Smith

Lecture—4 hours. Selected topics in international law; territory, sovereign immunity, responsibility, the peaceful settlement or nonsettlement of international disputes.

123. The Politics of Interdependence (4) I. Money;

II. The Staff

Lecture—3 hours; term paper. Prerequisite: upper division standing or consent of instructor. In the past several decades, growing economic interdependence has generated new problems in international relations. Course deals with difficulties in managing complex interdependence and its implication on national policies and politics.

124. The Politics of Global Inequality (4) III. Money

Lecture—3 hours; term paper. Prerequisite: upper division standing; course 123 recommended. Long-standing division of the global system into richer and poorer regions poses many important problems in international political economy. Course presents a theoretical background to North-South issues and analyses of current problems in economic and political relations.

126. Ethnic Self-Determination and International Conflict (4) III. Rothchild

Lecture—3 hours; individual meetings with students to discuss term papers. Prerequisite: one international relations course recommended. Compares the claims of the state and ethnic peoples in countries undergoing internal conflicts, e.g., South Africa, Northern Ireland. Analyzes the role of the international community in facilitating the peaceful resolution of conflicts.

***127. Nationalism and Imperialism** (4) II. The Staff

Lecture—4 hours. Prerequisite: upper division standing; course 3 recommended. Theory of nation building illustrated by Western and non-Western experience. Offered in alternate years.

128. International Communism (4) II. Bahry

Lecture—4 hours. Prerequisite: upper division standing; course 2 or 3, or consent of instructor. International communist movement; ideology organization, strategy. Relations among communist parties; problems of leadership and social composition; the Sino-Soviet conflict and its effects on revolutionary struggle. Offered in alternate years.

***129. Special Studies in International Politics** (4)

III. Siverson

Lecture—3 hours; term paper. Prerequisite: upper division standing. Intensive examination of one or more special problems in international politics. May be repeated once for credit when different topic is studied.

130. Recent U.S. Foreign Policy (4) II. Nincic; III.

Gartner

Lecture—3 hours; term paper. Prerequisite: upper division standing or consent of instructor. Broad survey of the development of U.S. foreign policy in twentieth century with emphasis on transformation of policy during and after World War II, and the introduction to analytic tools and concepts useful for understanding of current foreign policy issues.

131. Analysis of U.S. Foreign Policy (4) I. Goldman;

III. Nincic

Lecture—3 hours; term paper. Prerequisite: upper division standing or consent of instructor. Detailed presentation and examination of the formulation of execution of U.S. foreign policy. Survey of numerous factors influencing policy outcomes and how such determinants vary according to policy issue areas.

132. National Security Policy (4) I. Goldman; II.

Gartner

Lecture—3 hours; term paper. Prerequisite: upper division standing. Development of national security policies since 1945. Analysis of deterrence and assumptions upon which it is based. Effects of nuclear weapons upon conduct of war, alliance systems, and the international system. Prospects of security and stability through arms control.

***133. The American Role in East Asia** (4) I. The

Staff

Lecture—4 hours. Prerequisite: upper division standing; course 3 recommended. Survey of the role the United States has played in East Asia. Influence on Asian westernization of U.S. governmental East Asian policy, missionaries, traders, and returning students. Offered in alternate years.

134. Africa and U.S. Foreign Policy (4) I. Rothchild

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Overview of American foreign policy toward Africa. Relationship to global adversaries. Legacies of colonialism. Challenge of national self-determination and white racism. Policies on nonalignment, producer cartels, multinational corporations, continental integration, and trade and aid relations.

***136. Russian Foreign Policy** (4) II. Bahry

Lecture/discussion—4 hours. Prerequisite: upper division standing and course 2. The making and implementation of foreign policy after Soviet rule; the legacies of Tsarism and Bolshevism; resources, constraints and capabilities of the "new Russia" in the international system.

137. International Relations in Western Europe (4)

III. Money

Lecture—4 hours. Prerequisite: upper division standing. Analysis of European unity, problems of the Atlantic alliance, Atlantic political economy, East-West relations, Communism in Western Europe and the relationship between domestic politics and foreign policy.

***138. International Relations: East Asia** (4) I. The

Staff

Lecture—4 hours. Prerequisite: upper division standing; course 3 recommended. Analysis of international relations and diplomacy in East Asia. Emphasis upon twentieth century problems with examples from China, Japan, Korea, and Southeast Asia.

139. Special Studies in Foreign Policy (4) I. Nincic

Lecture—3 hours; term paper. Prerequisite: upper division standing or consent of instructor. Extensive examination of one or more special problems in foreign policy. May be repeated once for credit when different topic is studied.

140. Comparative Public Policy (4) I. Skalaban

Lecture—3 hours; term paper. Prerequisite: upper division standing, institutions, processes, and public policies of modern states. Emphasis on democratic, socialist, communist and fascist experience.

***141. Communist Political Systems** (4) III. Bahry

Lecture—4 hours. Prerequisite: course 2 or consent of instructor. Systematic comparative analysis of the origin, structure and performance of communist political systems with emphasis on the Soviet Union and the states of Eastern Europe.

142. Politics and Inequality (4) II. Jackman

Lecture—3 hours; term paper or discussion—1 hour. Examines the linkages between politics and the distribution of social and economic goods. Topics include the impact of civil rights legislation, the politics of welfare states, and the effects of political participation on the distribution of goods.

143. Politics in the Commonwealth of Independent States and the Baltic (4) III. Bahry
Lecture/discussion—4 hours. Prerequisite: course 2 and upper division standing. Creation of new political and economic structures in newly independent states; departures from central planning; dilemmas of cooperation; analysis of divergent reform strategies; integration into international political and economic system.

***144. Russian Politics and Policy** (4) III. Bahry
Lecture/discussion—4 hours. Prerequisite: upper division standing and course 2. Democratization, state-building and economic reform; creation of new institutions; impacts of Soviet rule.

145. Government and Politics in Emergent Nations (4) III. The Staff
Lecture—4 hours. Prerequisite: course 2. Conceptual study of problems of political organization and procedure in the context of rapid change engendered by social revolution in "emergent countries" and liberation from colonial oppression. Offered in alternate years.

146. Contemporary African Politics (4) II. Rothchild
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Analysis of party systems, military coups, bureaucracy, regional integration, and disintegration, and economic development in Africa south of the Sahara.

147. Politics and Policy in Western Europe (4) I. Money
Lecture—4 hours. The evolution, politics, and contemporary problems of selected political systems of Western Europe.

148A. Government and Politics in East Asia: China (4) II. The Staff
Lecture—4 hours. Prerequisite: course 2 recommended. Evolution of political institutions and political culture in China with emphasis on the post-1949 period. Primary attention to nationalism, modernization and political efficacy.

148B. Government and Politics in East Asia: Pacific Rim (4) III. The Staff
Lecture—4 hours. Prerequisite: course 2 recommended. Establishment and evolution of political cultures and establishment of political institutions in selected countries of the Pacific Rim, namely Japan, Korea, Taiwan. Emphasis on post World War II.

***148C. Government and Politics in East Asia: Southeast Asia** (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 2 recommended. Evolution of political culture, institutions, economy of selected nations in Southeast Asia including Vietnam plus two or three other examples. Emphasis on imperialist legacy, nation building in multi-ethnic communities, contrasts between socialist and non-socialist development models. Offered in alternate years.

***149. Politics of Development in Africa** (4) II. Rothchild
Lecture/discussion—4 hours. Prerequisite: course 134 recommended. Analysis of the developmental process in sub-Saharan Africa. Emphasis will be placed upon state and state institution, state-society relations, ethnicity, socioeconomic class, women, ideology, party systems, bureaucracy, military and developmental choices.

150X. Judicial Politics and Constitutional Interpretation (4) I. The Staff; II. Gates
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing. Politics of judicial policymaking; issues surrounding constitutional interpretation and decisionmaking; prerequisite for courses on the politics of constitutional law.

151. The Constitutional Politics of the First Amendment and the Right to Privacy (4) III. Gates
Lecture—3 hours; discussion—1 hour. Prerequisite: course 150. The constitutional politics surrounding such issues as the right to free expression, associational rights, the right to free exercise of religious beliefs, and the right to privacy.

152. The Constitutional Politics of Equality (4) II. Spriggs
Lecture—3 hours; discussion—1 hour. Prerequisite: course 150. Constitutional politics of equality in the American political system; issues surrounding constitutional doctrine and judicial policymaking; special attention on racial and sexual equality. Offered in alternate years.

153. The Constitutional Politics of the Justice System (4) III. Spriggs
Lecture—3 hours; discussion—1 hour. Prerequisite: course 150. Constitutional politics of the American criminal justice system; the issues surrounding constitutional doctrine and judicial policymaking on issues such as search and seizure, arrest, trial, incarceration, and other issues of due process. Offered in alternate years.

***154. Legal Philosophy** (4) II. Sinopoli
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing. Analysis of the nature and functions of law; law as an instrument of social control and the relationship between law and morality. Offered in alternate years.

155. Judicial Process and Behavior (4) III. Gates
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing. Analysis of the behavior of judges and courts in the political process. Techniques of judicial decisionmaking. Relationships among courts and other decision-making bodies. Offered in alternate years.

***156. Law and Society** (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing. Social basis and origins of law; relationship between law, institutions, and social change. Offered in alternate years.

160. American Political Parties (4) II. Costantini
Lecture—3 hours; discussion—1 hour. Analysis of the structured operations of the party system in the United States; party functions and organizations, nomination processes, campaigns and elections, party trends and reforms.

***161. Comparative Political Parties** (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Organization, operation, governmental function and social bases of political parties especially in Great Britain and France but with some reference to other Western European countries.

162. Elections and Voting Behavior (4) I. Segura
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 recommended. Analysis of American elections and partisan behavior; political socialization, political participation, partisanship and individual and group determinants of voting.

163. Group Politics (4) I. Wade; III. James
Lecture—3 hours; discussion—1 hour. Groups, institutions, and individuals, especially in American politics. Historical and analytical treatment of group theories as applied to interest groups (especially labor, business, agriculture, science, military); to racial, ethnic, and sectional groups; to parties, public and legislative groups, bureaucracies.

***164. Public Opinion** (4) II. Costantini
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing and course 1 or 5, or consent of instructor. Nature of public opinion in America as it is "supposed to be" and as it is. Distribution of opinions among different publics and the significance of that distribution for system stability and institutions. Opinion polling and its problems.

165. Mass Media and Politics (4) III. Costantini
Lecture—3 hours; discussion—1 hour. Organization of and decision making within the media; media audiences and the effect of the media on attitudes and behavior; the relationship of the government to the media (censorship, secrecy, freedom of the press, government regulation); the media in election campaigns.

***166. Women in Politics** (4) III. The Staff
Lecture—3 hours; discussion—1 hour or seminar—1 hour. The role of women in American politics. Historical experiences; contemporary organizations and strategies; areas of legislative concern; the impact of

differences in social class, race, and ethnicity upon the involvement of women in politics.

***167. Political Socialization** (4) II. Costantini
Lecture—3 hours; discussion—1 hour. Prerequisite: course 164 or consent of instructor. Who learns what about politics, and when and how they learn it. The process, content and sources of political learning, particularly in preadulthood, and the significance of such factors for the political system as well as for the development of the political self.

***168. Chicano Politics** (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Political aspects of Chicano life in America; examines the Chicano's political role as it has been historically defined by different groups in society and the Chicano's responses to his/her political environment.

***169. Political Elites** (4) I, II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1, 2, or 4, or consent of instructor. Background, careers, motives and beliefs of political leaders. Place of elites in a democratic polity; elite-mass differences; conflict and consensus among elites.

***170. Politics and Personality** (4) III. Berman
Lecture—3 hours; discussion—1 hour. How is conduct of politics influenced by personal qualities of political actors? Course focuses on developing criteria for analyzing political phenomena in psychological terms by examining selected writings of twentieth-century theorists and psychobiographies.

***171. The Politics of Energy** (4) II. Wandesforde-Smith
Lecture/discussion—4 hours. Prerequisite: upper division standing. Analysis of nature and performance of political processes for making energy choices at the international, national and state levels. Emphasizes interaction of energy policy with other political goals and the ability of governmental institutions to overcome constraints on policy innovation.

***173. Community Power and Change** (4) II. Jackman
Lecture—3 hours; discussion—1 hour. An examination of the relationship between general community characteristics, the distribution of political power, and policy outputs in the United States. Alternative models of community political change are presented.

174. Government and the Economy (4) I. Skalaban
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Political basis of economic policy (taxation, spending and regulation); impact of prices, employment and growth on political demands; elite responses to economic conditions; policy alternatives and the public interest.

175. Science, Technology, and Policy (4) II. Hill
Lecture—3 hours; discussion—1 hour. Analysis of policy-making for science and the use of scientific expertise for making decisions about technology. Topics include funding of basic research, relationship of science to technological development, science and military policy, technological risks, technology assessment and scientists and politics.

***176. Power and Coercion** (4) II. Jackman
Lecture—4 hours. Prerequisite: course 1 or Sociology 1 recommended. Examination of the meaning, sources, and diverse expressions of power and coercion in our lives. Concepts are explored by applying them to a broad range of issues, such as sexual harassment, racial subordination, legislative policymaking, and ideological hegemony.

***177. Modern Dictatorships** (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: upper division standing in Political Science or consent of instructor. Selected political processes and institutions of dictatorships in Germany, Italy, Russia, Spain, Japan, and other states. Topics include executives, legislatures, parties, courts, bureaucracies, communications, and public opinion with comparisons to U.S. processes.

178. Political Development in Modernizing Societies (4) I. Jackman
Lecture—3 hours; discussion—1 hour. Nature and sequence of political development; its economic and

social concomitants; role of elites, military, bureaucracy, and party systems; social stratification and group politics; social mobilization and political participation; instability, violence, and the politics of integration.

179. Special Studies in Comparative Politics (4) II. Bahry

Seminar—4 hours. Prerequisite: consent of instructor and upper division standing. Intensive examination of one or more special problems appropriate to comparative politics. May be repeated once for credit.

***180. Bureaucracy in Modern Society (4) II.** Wandesforde-Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Role of bureaucracy in a complex society, with emphasis upon changing relationships between government and the economy; consequences of rapid technological and social change for bureaucratic structures and processes; the problems of reconciling expertise and democracy and increasing the responsiveness of public bureaucracy.

***181. The American Administrative System (4) I.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Introduction to the development and organization of administrative institutions in the American federal system; focus on design and reorganization, and the relationship of structure to performance, at the national, subnational, and local levels.

182. Administrative Decision Making and Public Policy (4) II. The Staff

Lecture—3 hours; special assignments. Approaches to and models of administrative decision making; techniques of substantive policy analysis; problems and developments in planning, budgeting, personnel, and administrative reform.

***183. Administrative Behavior (4) III.** The Staff

Lecture—3 hours; discussion—1 hour. The implications for American public administration of evolving concepts about behavior in organizations.

187. Administrative Theory (4) I. Hill

Lecture—3 hours; discussion—1 hour. Historical and critical analysis of the principal theories of organization and management of public agencies in the light of such concepts as decision making, bureaucracy, authority and power, communication and control; an examination of the role of government bureaucracies in the total society.

***188. Manpower Policy and Personnel Administration (4) III.** The Staff

Lecture—3 hours; discussion—1 hour. Politics and economics of effective manpower programs; planning manpower needs; recruitment, selection, and administration of public personnel; training and development; unions and collective bargaining; affirmative action; ethics and morality in the public service.

***189. Politics of Budgeting and Finance Administration (4) III.** The Staff

Lecture—3 hours; discussion—1 hour. Fiscal role of government in mixed economy and democratic society; politics of revenue and resource allocation; tax policy; inter-governmental financial relations; budget formulation and execution; alternative models of resource allocation; budget as a tool of management.

***190. International Relations (4) II.** The Staff

Lecture—2 hours; discussion—2 hours. Prerequisite: open to majors in International Relations, or consent of instructor. Analysis and evaluation of substantive issues in contemporary international relations. Readings drawn from current academic and non-academic periodicals.

***191. Special Studies in Local Government and Politics (4) III.** The Staff

Lecture—3 hours; fieldwork—1 hour. Prerequisite: consent of instructor; enrollment limited to advanced students. Intensive study of one or more topics relating to urban policy and politics, designed for advanced students. Group projects and field work in one or more communities are emphasized.

192A. Internship in Public Affairs (5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: enrollment dependent on availability of intern positions with highest priority assigned to students with Political Science—Public Service major; upper division standing. Supervised internship and study in political, governmental, or related organizations. (P/NP grading only.)

192B. Internship in Public Affairs (5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: course 192A; enrollment dependent on availability of intern positions with highest priority assigned to students with Political Science—Public Service major; upper division standing. Supervised internship and study in political, governmental, or related organizations. (P/NP grading only.)

192W. Internship in the UC Davis Washington Center Program (6-8) I, III. Jentleson and staff

Internship—30-35 hours. Prerequisite: junior or senior standing and admission into the UC Davis Washington Center undergraduate program. Internship in Washington, D.C. with associated research project, under the supervision of a faculty sponsor. (P/NP grading only.)

193. Research in Practical Politics (2) I, II, III. The Staff

Research project—6 hours. Prerequisite: courses 192A, 192B; open only to Political Science—Public Service majors, for whom it is required. Supervised preparation of an extensive paper relating internship experience to concepts, literature, and theory of political science.

194HA-194HB-194HC. Special Study for Honors Students (2-3-5) I, II, III. The Staff

Directed research. Prerequisite: major in Political Science or Political Science—Public Service with junior standing and overall grade-point average of 3.5. Directed reading, research, and writing culminating in the preparation of a senior honors thesis under direction of faculty adviser. (Deferred grading only, pending completion of sequence.)

195. Special Studies in American Politics (4) I. Segura; III. The Staff

Seminar—4 hours. Prerequisite: consent of instructor and upper division standing. Intensive examination of one or more special problems appropriate to American politics. May be repeated once for credit when different subject matter studied.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

***201. Urban Government and Politics (4) III.** The Staff

Seminar—4 hours. Survey and analysis of the literature in the field of local government and politics in the United States. Approaches to the study of political reform, local autonomy, community power, representation, expertise, service delivery, policy-making and political change. Offered in alternate years.

***202. American State Government and Politics (4) I.** The Staff

Seminar—4 hours. Survey and analysis of the literature in the field of state government, politics, and policy. Approaches to the study of the American states as political systems, including their governing institutions and processes and their role in the Federal system. Offered in alternate years.

***203A. American Government: The Presidency (4) III.** Berman

Seminar—4 hours. Thorough overview of the current research on political executives, with particular emphasis on the American presidency. Two principal goals: the development of important and innovative student research programs; and adequate preparation for qualifying examinations.

203B. American Government: Congress (4) III.

Segura

Seminar—4 hours. Thorough overview of the current research on Congress, with particular emphasis on political representation. Two principal goals: the development of important and innovative student research programs; and adequate preparation for qualifying examinations.

***203C. American Government: Courts (4) I.** Gates

Seminar—4 hours. Survey and analysis of the literature in the field of American government with a focus on courts. Emphasis on the development and testing of theories of behavior and processes.

***205. Field Research in Urban Politics and Policy (4) III.** The Staff

Seminar—2 hours; field research—2 hours. Examination of research design and methodologies appropriate to field research in community-level politics and policy, with an emphasis on elite interviewing and observation. Analysis of illustrative studies. Team participation in design, execution, and analysis of a field research project.

***207. Environmental Public Policy (4) II.** Wandesforde-Smith

Seminar—4 hours. Analysis of the interface between the world of academic reflection about ecological and environmental problems and the world of political action. Evaluation of alternative approaches to policy analysis and recommendation. Individual research, including field research, will parallel discussion of the literature.

208. Policy Analysis (4) II. Hill

Seminar—4 hours. Social science techniques applied to public policy formation and evaluation.

209. The American Political System (4) I. Wade

Seminar—4 hours. Analysis of selected theoretical and empirical issues posed by contemporary research in American government and politics.

211. Research Methods in Political Science (4) I. Jackman

Seminar—4 hours. Prerequisite: Statistics 13; graduate standing or permission of instructor. Introduction to philosophy of science, research design for experimental and quasi-experimental settings, and data analysis. Topics include: logic of empirical research, measurement problems, research design, sampling, descriptive statistics, tabular analysis, measures of association, and introduction to correlation and regression.

212. Quantitative Analysis in Political Science (4) II. Gates

Seminar—4 hours. Prerequisite: course 211. Topics usually covered in an introductory statistics course with an emphasis on applications in political science—descriptive statistics for samples, probability and probability distributions, hypothesis testing, ANOVA, bivariate regression, and introduction to multiple regression.

***213. Quantitative Analysis in Political Science II (4) III.** Gartner

Seminar—4 hours. Prerequisite: courses 211, 212. More advanced topics in the use of statistical methods, with emphasis on political applications. Topics include: properties of least squares estimates, problems in multiple regression, and advanced topics (probit analysis, simultaneous models, time-series analysis, etc.)

***214A-214B. Research in Political Science (2-2) II-III.** The Staff

Seminar—2 hours. Prerequisite: courses 211, 212. Research seminar sequence required of all Ph.D. students. Design, execution and defense of an original piece of research in political science, culminating in a paper of publishable quality. (Deferred grading only, pending completion of sequence.)

215. Introduction to Modeling Political Behavior (4) III. Gartner

Seminar—3 hours. Prerequisite: courses 211 and 212. Introduction to formal and game theoretic analyses of politics. Students will learn basic game theory and modeling skills. We examine the benefits of modeling, and look at the examples of formal analysis in a

variety of political science sub-fields. Offered in alternate years.

218. Political Theory (4) III. Sinopoli
Seminar—3 hours; term paper.

223. International Relations (4) II. Gartner
Seminar—3 hours; term paper.

225. The International System (4) I. Siverson
Seminar—3 hours; term paper. Analysis of the international system by means of theory formulation and integration; critique of research designs; use of various techniques of data generation and analysis.

230. American Foreign Policy (4) III. Goldman
Seminar—3 hours; term paper.

231. U.S. Political Culture and Foreign Relations (4) III. Rothchild

Seminar—3 hours; term paper. Relates U.S. political culture to formulation of foreign policy. Analyzes American ideological preferences in historical perspective, contemporary public opinion, decision-making and implementation. Concludes by examining linkages between foreign policy behavior and democratic process. Offered in alternate years.

241. Communist Political Systems (4) III. Bahry
Seminar—4 hours. Prerequisite: course 141 or the equivalent, or consent of instructor. Systematic analysis of selected topics dealing with the political process of Communist political systems.

***242. Seminar in Comparative Politics (4) II.** The Staff
Seminar—3 hours; term paper. Prerequisite: graduate status or consent of instructor. Systematic survey of theories and methods used in the study of Comparative Politics.

***246. Policymaking in Third-World Societies (4) II.** Rothchild

Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Included in an analysis of policy making process in Third-World countries are such topics as political resources, institutional resources, decision-making, resource allocations, planning, and budgeting, implementation, and distribution of world resources. Offered in alternate years.

***248. Politics of East Asia (4) III.** The Staff
Seminar—3 hours; term paper. Selected contemporary problems of government and international relations in East Asia.

260. Political Parties (4) I. Costantini
Seminar—3 hours; term paper. Survey of selected topics in American and comparative parties.

***261. Political Behavior (4) II.** Segura
Seminar—3 hours; term paper. Survey of selected topics in political behavior and public opinion.

***274. Political Economy (4) III.** The Staff
Seminar—4 hours. Politics of economic policy as reflected in taxation, spending and regulation; impact of prices, employment, and growth on political demands; government responses to economic conditions; electoral politics and the political business cycle. Offered in alternate years.

***282. Concepts and Problems in Public Administration (4) I.** The Staff
Seminar—4 hours. Nature of administrative processes in modern society; analysis of complex organizations; contemporary management practices and processes; means of controlling bureaucracy. Offered in alternate years.

***283. Organizational Behavior (4) II.** The Staff
Seminar—4 hours. Organizational behavior as it relates to public sector decision-making.

***286. Administrative Values (4) III.** The Staff
Seminar—3 hours; term paper. Examination of American administrative values. Offered in alternate years.

290A. Research in American Government and Public Policy (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of American government and public policy.

290B. Research in Political Theory (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of political theory.

290C. Research in International Relations (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of international relations.

290D. Research in Judicial Politics (4) I, II, III. The Staff
Seminar—4 hours. Prerequisite: graduate standing in political science or consent of instructor. Contemporary research on judicial politics, judicial institutions, jurisprudence, and judicial behavior.

290E. Research in Political Parties, Politics, and Political Behavior (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of political parties, politics, and political behavior.

290F. Research in Comparative Government and Policy (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of comparative government and policy.

290G. Research in Public Administration (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of public administration.

297. Internships in Political Science (2) I, II, III. The Staff

Seminar—2 hours. Prerequisite: open only to persons who have internships or other positions in governmental agencies, political parties, etc. Application and evaluation of theoretical concepts through work experience or systematic observation in public and political agencies. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Directed Reading (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

390. The Teaching of Political Science (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: graduate student standing in Political Science. Methods and problems of teaching political science at the undergraduate level. (S/U grading only.)

Pomology

(College of Agricultural and Environmental Sciences)
F. A. Bliss, Ph.D., Chairperson of the Department
Department Office, 1045 Wickson Hall (916-752-0123)

Faculty

- Fredrick A. Bliss, Ph.D., Professor
- Patrick H. Brown, Ph.D., Assistant Professor
- Carlos H. Crisosto, Ph.D., Lecturer
- Abhaya M. Dandekar, Ph.D., Associate Professor
- Theodore M. DeJong, Ph.D., Professor
- Louise Ferguson, Ph.D., Lecturer
- Thomas M. Gradziel, Ph.D., Associate Professor
- Scott Johnson, Ph.D., Lecturer
- Adel A. Kader, Ph.D., Professor
- John M. Labavitch, Ph.D., Professor
- George C. Martin, Ph.D., Professor
- Gale McGranahan, Ph.D., Lecturer
- Warren C. Micke, M.S., Lecturer

- Elizabeth J. Mitcham, Ph.D., Lecturer
- Dan E. Parfitt, Ph.D., Lecturer
- Vito S. Polito, Ph.D., Professor
- David E. Ramos, Ph.D., Lecturer
- Kenneth A. Shackel, Ph.D., Associate Professor
- Douglas V. Shaw, Ph.D., Associate Professor
- Stephen M. Southwick, Ph.D., Lecturer
- Ellen G. Sutter, Ph.D., Associate Professor
- Steven A. Weinbaum, Ph.D., Professor

Emeriti Faculty

- Royce S. Bringham, Ph.D., Professor Emeritus
- Dillon S. Brown, Ph.D., Professor Emeritus
- Robert M. Carlson, Ph.D., Lecturer Emeritus
- Peter B. Catlin, Ph.D., Lecturer Emeritus
- Julian C. Crane, Ph.D., Professor Emeritus
- William H. Griggs, Ph.D., Professor Emeritus
- Paul E. Hansche, Ph.D., Professor Emeritus
- Hudson T. Hartmann, Ph.D., Professor Emeritus
- Dale E. Kester, Ph.D., Professor Emeritus
- F. Gordon Mitchell, M.S., Lecturer Emeritus
- Roger J. Romani, Ph.D., Professor Emeritus
- Kay Ryugo, Ph.D., Professor Emeritus
- Noel F. Sommer, Ph.D., Lecturer Emeritus
- Kiyoto Uriu, Ph.D., Professor Emeritus

Related Major Programs. See the majors in Plant Science and in Agricultural Systems and Environment.

Related Courses. Pomology faculty also teach the following courses that contribute to majors and graduate programs in Agricultural Systems and Environment, Horticulture, and Plant Biology:

Agricultural Systems and Environment 1, 1G, 107, 170A, 170B, Plant Biology 201, 202, 208, 212, 214, Plant Science 104, 107, 109, 112, 112L, 115, 116, 135, 140.

Graduate Study. For graduate study related to the field of pomology, see the M.S. degree program in Horticulture. See also the Graduate Studies section in this catalog.

Concordance

The following courses in Pomology have been transferred to other subject areas.

Former Course Number	Equivalent new course and number
101	Plant Science 115 (Biological Applications in Pomology)
102	Plant Science 116 (Principles of Fruit Production)
107	Agricultural Systems and Environment 107 (Small Fruit Production)
170A	Agricultural Systems and Environment 170A (Fruit and Nut Cropping Systems)
170B	Agricultural Systems and Environment 170B (Fruit and Nut Cropping Systems)

Courses in Pomology (POM)

Lower Division Courses

10. The Art and Science of Fruit Production (3) I. The Staff (Polito in charge)

Lecture—3 hours. Introduction to pomology including: orchard establishment, developmental physiology, and management of the crop through harvest and storage. Two field exercises, on the second and seventh Saturdays in the quarter. General Education credit: Nature and Environment.

92. Internship in Pomology (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: consent of instructor. Work experience on and/or off campus in the production and management of orchard crops or closely related enterprises. (P/NP grading only.)

Upper Division Courses

***103. Citrus and Other Subtropical Fruits (3) II.** Shackel in charge
Lecture—3 hours. Prerequisite: Biological Sciences 1C. Subtropical fruits, particularly citrus, as important

*Course not offered this academic year.

economic and nutritional resources; their origin, distribution, botanical nature, culture, production, and utilization. Offered in alternate years.

192. Internship in Pomology (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: consent of instructor. Work experience on and off campus in the production and management of orchard crops or closely related enterprises. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

203. Current Perspectives in Fruit Tree Physiology (3) I. Weinbaum, DeJong
Lecture—2 hours; discussion—1 hour. Prerequisite: Biochemistry 101A-101B, Botany 111, 112 or Plant Science 102; courses 101 and 102. Current advances/concepts regarding physiological bases of developmental phenomena specific to and/or characteristic of deciduous perennial fruit plants. Offered in alternate years.

***205. Water Relations and Mineral Nutrition of Deciduous Fruit Crops** (4) III. Carlson, Shackel
Lecture—3 hours; two full-day field trips. Prerequisite: Soil Science 109, Botany 111, 112 or Plant Science 102. Development and distribution of roots, irrigation and water relations, mineral nutrient status, deficiencies and excesses, symptoms, use of tissue analysis, chelates and deficiency corrections as factors in orchard management. Offered in alternate years.

210. Plant Reproductive Morphology (4) III. Polito
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Botany 105, or Botany 111A and 111B. Biology and morphology of flowering plant sexual reproduction. Specific topics include evocation, floral transition and organogenesis, ovule and pollen development, pollination, self-incompatibility, fertilization, fruit set and fruit morphology. Emphasis on species of pomological interest.

***212. Postharvest Biology and Biotechnology of Fruits and Nuts** (3) III. Kader, Mitcham
Lecture—3 hours. Prerequisite: Plant Science 112 or the equivalent. Review of postharvest biology of fruits and nuts in relation to biotechnological procedures used in handling, emphasizing research needs. Offered in alternate years.

***220. Quantitative Genetics and Selection Theory** (3) II. Shaw
Lecture—3 hours. Prerequisite: Animal Genetics 107, Plant Science 113, Agronomy 205A. Theory and application of quantitative genetic principles to the breeding, testing, and selection of horticultural crop plants. Topics include: heritability, selection using information from relatives, indirect selection, genetic correlations, multiple trait selection, inbreeding, crop stability, and field testing.

221. Principles and Practices of Line Cultivar Breeding (3) III. Bliss
Lecture—3 hours. Prerequisite: Genetics 100, Plant Science 113, Agronomy 205A. Application of genetic principles and selection theory to the production and testing of inbred lines in self- and cross-pollinated crops. Topics include types of cultivars, genetic parameters of inbreeding populations and breeding methods to produce superior inbreds. Offered in alternate years.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III, Summer. The Staff (Chairperson in charge)
(S/U grading only.)

Population Biology (A Graduate Group)

Michael Turelli, Ph.D., Chairperson of the Group
Group Office, 2320 Storer Hall (916-752-8523)

Faculty. Includes 30 members from the Division of Biological Sciences, The Division of Environmental Studies, and the Departments of Agronomy, Entomology, Geology, Philosophy, Veterinary Epidemiology, and Wildlife and Fisheries Biology.

Graduate Study. The Graduate Group in Population Biology emphasizes programs of study and research leading to the Ph.D. degree. The Group concentrates on population biology as the broad discipline that blends ecology, evolution, population genetics and systematics into a unified field. The course curriculum consists of first-year core courses offered by the Group faculty, seminars, and advanced courses in population biology, and related disciplines, chosen in consultation with a guiding committee.

Graduate Adviser. Consult the Population Biology Graduate Group Office.

Courses in Population Biology (PBG)

Graduate Courses

200A. Principles of Population Biology (5) I. Botsford, Gillespie
Lecture—3 hours; discussion—2 hours. Prerequisite: course 231 concurrently and consent of instructor. Principles of single-species ecology and evolution. Topics include ecology of individuals, population growth models, structured populations, life history strategies, stochastic populations, basic population genetics theory, deleterious alleles in natural populations, and molecular population genetics.

200B. Principles of Population Biology (5) II. Quinn, Schoener, Strong
Lecture—3 hours; discussion—2 hours. Prerequisite: course 200A. Principles of multi-species communities. Topics include trophic-level interactions, epidemiology, competition, mutualism, food webs and trophic cascades, interactions between simple ecologic communities, island biogeography, succession, and large-scale patterns.

200C. Principles of Population Biology (5) III. Shaffer, Turelli, Ward
Lecture—3 hours; discussion—2 hours. Prerequisite: course 200B. Principles of macroevolution. Topics include evolutionary quantitative genetics, sex ratio evolution, sexual selection, Darwinism, speciation and hybridization, the fossil record, vicariance, biotic exchanges, and phylogeny reconstruction.

203. Advanced Evolution (3) III. Gottlieb
Lecture—1 hour; discussion—2 hours. Prerequisite: graduate status. Adaptation and speciation, and biochemical and morphological evolution in plants and animals with emphasis on the appropriateness of different methods of analysis. Offered in alternate years.

***206. Ecology of Insect Parasitoids** (4) II. Rosenheim
Lecture—3 hours; seminar—1 hour. Prerequisite: introductory animal ecology or behavior. Insect parasitoids will be investigated as model systems to address current topics in behavior, population, and evolutionary ecology. Theory will be synthesized and critical empirical tests of ecological hypotheses emphasized. Offered in alternate years. (Same course as Entomology 206.)

***209. Molecular Evolution** (3) III. Gillespie, Langley
Lecture—3 hours. Prerequisite: Biological Sciences 103; Evolution and Ecology 100 recommended. Evolution from the molecular standpoint, including the evolution of genome structure and the organization of single genes and gene clusters, evolution of enzymes and metabolic pathways, molecular clocks, transposons and other movable genetic elements, and

molecular polymorphisms. Offered in alternate years. (S/U grading only.)

212. Topics in Invertebrate Evolution (2) III. Grosberg
Seminar—2 hours. Prerequisite: graduate standing or consent of instructor and Evolution and Ecology 112-112L; courses in evolutionary biology, systematics, and ecology highly recommended. Advanced seminar that critically examines problems relevant to evolutionary patterns among the invertebrates. May be repeated for credit when topic differs. (Former course Zoology 212.) (S/U grading only.)

231. Mathematical Methods in Population Biology (3) I. Hastings
Lecture—3 hours. Prerequisite: Mathematics 16C or 21C or the equivalent. Mathematical methods used in population biology. Linear and nonlinear difference equation and differential equation models are studied, using stability analysis and qualitative methods. Partial differential equation models are introduced. Applications to population biology are stressed. (Same course as Ecology 231.)

270. Research Conference in Evolutionary Biology (1) I. Grosberg; II. Shaffer; III. Turelli
Seminar—1 hour. Prerequisite: consent of instructor. Critical presentation and evaluation of current literature and ongoing research in evolutionary biology. (Former course Zoology 270.) (S/U grading only.)

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Seminars presented by visiting lecturers, UCD graduate students and faculty. May be repeated for credit. (S/U grading only.)

290C. Research Conference in Population Biology (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor; concurrent enrollment in course 299. Presentation and discussion of faculty and graduate student research in population biology. May be repeated for credit. (S/U grading only.)

296. Seminar in Geographical Ecology (2) III. Shapiro
Seminar—2 hours. Prerequisite: Evolution and Ecology 100 or 101 or consent of instructor. Recent developments in theoretical and experimental biogeography, historical biogeography and related themes in systematics, the biology of colonizing species, and related topics. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Population Health and Reproduction

(School of Veterinary Medicine)

Robert H. Bondurant, D.V.M., Chairperson of the Department

Department Office, 1114 Medical Science 1A
(916-752-1358; FAX: 916-752-4278)

Faculty

Robert H. Bondurant, D.V.M., Professor
JoAnne Boorkman, M.S.L.S., Lecturer
Ann Trommershausen Bowling, Ph.D., Adjunct Professor

Bruno B. Chomel, D.V.M., Ph.D., Assistant Professor
Thomas B. Farver, Ph.D., Professor
Walter Guterbock, D.V.M., Clinician
Lynette A. Hart, M.A., Ph.D., assistant Professor
Charles A. Holmberg, Ph.D., Professor

Phillip H. Kass, D.V.M., Ph.D., Assistant Professor
 G. Koenig, D.V.M., Clinician
 Bill L. Lasley, Ph.D., Professor
 Terry Lehenbauer, D.V.M., M.P.V.M., Ph.D., Assistant Professor
 Nicholas W. Lerche, D.V.M., M.P.V.M., Assistant Adjunct Professor
 Irwin K. M. Liu, D.V.M., Ph.D., Professor
 Richard H. McCapes, D.V.M., Senior Lecturer
 James Murray, Ph.D., Associate Professor
(Population Health and Reproduction, Animal Science)
 Joan D. Rowe, D.V.M., Ph.D., Assistant Professor
 Frederic Stevens, D.V.M., M.S., Lecturer
 Mark Vanderlist, B.V.Sc., M.P.V.M., Clinician
 Patricia S. Wakenell, D.V.M., Ph.D., Assistant Professor
 Leon D. Weaver, Sr. Lecturer
 George B. E. West, D.V.M., M.P.V.M., Lecturer

Research Faculty

Kurt P. Snipes, Ph.D., Visiting Associate Research Microbiologist
 Robert B. Walsh, D.V.M., Assistant Research Microbiologist

Emeriti Faculty

Domenico Bernoco, D.V.M., Libera Docenza, Associate Professor Emeritus
 Charles E. Franti, Ph.D., Professor Emeritus
 Constantin Genigeorgis, D.V.M., Ph.D., Professor Emeritus
 Charles A. Hjerpe, D.V.M., Professor Emeritus
 Jack A. Howarth, D.V.M., Ph.D., Professor Emeritus
 John P. Hughes, D.V.M., Professor Emeritus
 Richard H. McCapes, D.V.M. Senior Lecturer Emeritus
 Margaret E. Meyer, Ph.D., Professor Emerita
 Hans P. Riemann, D.V.M., Ph.D., Professor Emeritus
 Calvin W. Schwabe, D.V.M., M.P.H., Sc.D., Professor Emeritus
 Clyde J. Stormont, Ph.D., Professor Emeritus
 Richard Yamamoto, Ph.D., Professor Emeritus

Courses in Population Health and Reproduction (PHR)

Lower Division Course

92. Internship in Veterinary Science (1-4) I, II, III. The Staff (Chairperson in charge)
 Discussion/laboratory—1-4 hours; clinic—3-36 hours; final report. Prerequisite: approval of project prior to period of internship by faculty sponsor. Supervised work experience in Reproduction. (P/NP grading only.)

Upper Division Courses

***104. History of Veterinary Medicine** (3) III. Lecture—2 hours; discussion—1 hour. Veterinary medicine's role (from man's first domestication of animals to the decline of Rome) in building a foundation for rational healing; and its contributions during the eighteenth-twentieth centuries to the creation of modern medicine.

106. Human-Animal Interactions: Benefits and Issues

(2) II. Hart
 Lecture—2 hours. Prerequisite: upper division standing or consent of instructor. The contributions of animals to human society, including historic, anthropologic, developmental, human health, and therapeutic perspectives, as well as effects of humans on animals.

111. Animal Hygiene

(3) II. West
 Lecture—3 hours. Prerequisite: Biological Sciences 1A or consent of instructor. Causes, prevention, and control of animal diseases important in economic agriculture and in public health, with emphasis upon animal management factors in disease.

112. Immunogenetic and Electrophoretic Techniques

(2) I. Bernoco
 Lecture—1 hour; laboratory—3 hours. Prerequisite: Genetics 100 (or the equivalent), or consent of instructor. Immunologic and electrophoretic techniques used in the exploration of heritable differences in red

cell antigens, serum proteins, and enzymes of domestic animals.

150. Food-Borne Infections and Intoxications

(4) III. Genigeorgis, Riemann
 Lecture—4 hours. Prerequisite: Food Science and Technology 104, Veterinary Microbiology and Immunology 127. Prevalence and characteristics of those diseases of man which are derived from food or food sources; access of disease agents to and distribution in food and food sources; exposure of man to these agents; prevention of food-borne diseases.

192. Internship in Veterinary Science

(1-12) I, II, III. The Staff
 Discussion/laboratory—1-12 hours; clinic—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work experience in Reproduction. May be repeated for credit. (P/NP grading only.)

199. Special Study for Advanced Undergraduates

(1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Graduate Courses

202. Sampling in Health-Related Research

(3) I. Farver
 Lecture—3 hours. Prerequisite: Epidemiology and Preventive Medicine 403 or the equivalent; consent of instructor. A thorough coverage of simple random sampling, stratified sampling, cluster sampling, systematic sampling, and sequential sampling. Emphasis is on application of the sampling methods. Offered in alternate years.

*203. Multivariate Biostatistics

(3) I. Farver
 Lecture—3 hours. Prerequisite: Epidemiology and Preventive Medicine 403 and 404, or the equivalent; consent of instructor. Multivariate procedures covered are principal component analysis, factor analysis, Two-group and k-group multivariate ANOVA, multivariate regression, Two-group and k-group discriminant analysis and repeated measures analysis, cluster analysis, and canonical analysis. Emphasis is on application of procedures. Offered in alternate years.

212. Epidemiology of the Zoonoses

(4) II. Chomel
 Lecture—2 hours; discussion—2 hours. Prerequisite: graduate standing or third-year standing in School of Veterinary Medicine, or consent of instructor. Epidemiological, biological, and ecological features of some major infections shared by man and animals. Wildlife and domestic animals zoonoses of major health and economic significance are presented to illustrate how knowledge of zoonoses epidemiology is essential for implementing control measures.

220. Advanced Avian Medicine

(3) III. Lam, Wakenell
 Lecture—3 hours. Instruction on the methods of prevention of the major diseases of domestic poultry.

225. Preventive Avian Medical Practice

(3) II. The Staff (Chairperson in charge)
 Lecture—3 hours. Prerequisite: enrollment in avian medicine option of MPVM program, third- or fourth-year standing in School of Veterinary Medicine, or consent of instructor. Discussion of the economic structure of the broiler, commercial egg and turkey industries, and the delivery of preventive veterinary medical services within these industries. Specific prevention and eradication programs pertaining to diseases of economic importance are covered.

231. Pathophysiology of Mammalian Reproductive Processes

(3) III. Lasley
 Lecture—3 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor. Physiological and pathological aspects of reproductive failure in mammals concerning gonadal function, fertilization, implantation, prenatal mortality, neonatal mortality, environmental factors, anatomical and hereditary defects, intersexuality and behavior. Offered in alternate years.

254. Public Health Aspects of Meat and Meat Products Technology

(3) III. Genigeorgis
 Lecture—3 hours. Prerequisite: course 150 or consent of instructor. Study of the influence of techniques and

procedures for processing meats and meat products upon their wholesomeness as food.

*290A. Seminar

(1) I, II, III. The Staff
 Seminar—1 hour. Discussion of current topics in animal reproduction and medicine, as well as presentation of research findings by graduate students and faculty. May be repeated for credit. (S/U grading only.)

292. Current Topics in Reproduction

(1) I, II, III. Lasley
 Seminar—1 hour. Prerequisite: consent of instructor. Discussion of current scientific literature in reproduction, as well as presentation of research findings by graduate students and faculty. (S/U grading only.)

298. Group Study

(1-5) I, II, III. The Staff (Chairperson in charge)

299. Research

(1-12) I, II, III. The Staff (S/U grading only.)

Professional Courses

404. Herd Health Management

(1 1/2 per week) I, II, III. Hjerpe in charge
 Laboratory—50 hours total. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents apply their knowledge of veterinary medicine, animal nutrition, genetics, husbandry, management, and economics on a herd basis toward the improvement of food animal production efficiency through control and prevention of disease. (S/U grading only.)

420. Zoonoses of Primates

(2) II. Chomel, Lerche
 Lecture—2 hours. Prerequisite: second-, third-, or fourth-year standing in the School of Veterinary Medicine or School of Medicine, or consent of instructor. Epidemiological, clinical, and biological features of zoonoses of non-human primates. Emphasis given to major zoonoses which are threatening to human health and their treatment and prevention. Focus also on management of non-human primates in research, zoological gardens and in the world.

429A. Herd Health Management of Beef, Cattle, Swine, Sheep, and Goats

(4) II. East
 Lecture—40 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Practical systems for delivering veterinary service to feedlot, cow-calf, stocker, swine, sheep, and goat production units are considered, with emphasis on prevention and control of disease.

429B. Dairy Herd Health Management

(4) III. Weaver
 Lecture—40 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. Practical systems for delivering veterinary services to dairy farms with emphasis on disease prevention and production control. Lectures supplemented with visits to dairy farms to evaluate feeding programs and health management.

439. Beef Cattle Nutrition

(1) III. The Staff
 Lecture—10 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Economically sound methods for meeting nutrient requirements of feedlot and pasture beef cattle (including computer-assisted methods). Strategies for presenting nutritional and ration-associated diseases of beef cattle.

445A. Food Animal Theriogenology

(3) II. Bon-Durant
 Lecture—20 hours; laboratory—10 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine. Conditions affecting the reproductive system in the cow, sow, ewe, and goat, with emphasis on symptomatology, pathophysiology, treatment, control, prevention, and herd health applications.

445B. Equine Theriogenology

(3) II. Liu
 Lecture—20 hours; laboratory—10 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Discussion of special problems of equine reproduction with emphasis on methods of diagnosis and interpretation of clinical and laboratory findings.

446A. Food Animal Reproduction (1) III. Rowe
Lecture—6 hours; laboratory—4 three-hour sessions. Prerequisite: second-year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Conditions affecting the reproductive system in the cow, sow, ewe, and goat, with emphasis on symptomatology, pathophysiology, treatment, control, prevention, and herd health applications.

446B. Equine Reproduction (1) III. Liu
Lecture—6 hours; laboratory—4 three-hour sessions. Prerequisite: second-year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Discussion of special problems of equine reproduction with emphasis on methods of diagnosis and the interpretation of clinical and laboratory findings.

446C. Reproduction of Non-Domestic Animals (1) III. Lasley

Lecture—1 hour. Prerequisite: third-year standing in the School of Veterinary Medicine. Follows course 446A and provides information relating to reproduction in non-domestic mammals, birds, and reptile species. Concepts relating to the evaluation of reproductive status, diagnosis of infertility, assisted reproduction and contraception will be presented.

483. Pet Loss Support Rounds (1-2) I, II, III, IV. Hart

Discussion/laboratory—3-6 hours. Prerequisite: veterinary student status. Training and experience in responding to pet loss hotline callers who are experiencing grief associated with an animal's death. Students gain proficiency in supportive listening and referral to community resources and increase effectiveness in dealing with upset pet owners. (S/U grading only.)

Preventive Veterinary Medicine (A Graduate Program)

Group Office, 112 Surge-IV (916-752-2375/9174)

Graduate Study. The School of Veterinary Medicine offers a program of study and research leading to the Master's degree in Preventive Veterinary Medicine (M.P.V.M.). Detailed information on this program may be obtained by writing the Director, Department of Population Health and Reproduction.

Director. Thomas B. Farver (Population Health and Reproduction).

Courses in Preventive Veterinary Medicine (MPM)

Professional Courses

400. Orientation to Statistics (4) I.

Lecture—40 hours total. Prerequisite: enrollment in MPVM degree program. Introduction and overview to the concepts basic to biostatistics and epidemiology. (S/U grading only.)

401. Biomedical Information Resources and Retrieval (3) I. Boorkman

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: enrollment in MPVM Program or consent of instructor. Introduction to the skills and tools needed to find information in the biomedical sciences with an emphasis on veterinary medicine. Emphasis will be placed on selection of appropriate sources to solve a particular information need using both print and electronic reference and bibliographic sources.

402. Medical Statistics I (4) I, III.

Lecture—3 hours; laboratory/discussion—2 hours. Prerequisite: Fall quarter: course 400 or Statistics 13 (or the equivalent), and consent of instructor; Spring quarter: consent of instructor; restricted to students entering the DVM/MPVM dual degree program. Use of statistics in clinical, laboratory, and population med-

icine; graphical and tabular presentation; probability; binomial, Poisson, normal, t-, F-, and Chi-square distributions; elementary nonparametric methods; simple linear regression and correlation; lifetables.

403. Medical Statistics II (4) II.

Lecture—3 hours; laboratory/discussion—2 hours. Prerequisite: course 402. Continuation of course 402. Analysis of variance in biomedical sciences; non-parametric methods; multiple regression; biomedical applications of statistical methods.

404. Medical Statistics III (4) III.

Lecture—3 hours; laboratory/discussion—2 hours. Prerequisite: course 403. Continuation of course 403. Analysis of covariance, variable selection; analysis of multiway frequency tables; logistic regression; discriminant analysis; time dependent variation and trends; biomedical applications.

405. Principles of Epidemiology (5) I.

Lecture—3 hours; discussion—3 hours. Prerequisite: a degree in veterinary medicine, medicine, or dentistry, or consent of instructor. Approved for graduate degree credit. Combination of lectures, class discussions, and problem solving. Topics are methods of investigating disease outbreaks, quantitating disease in populations, medical ecology survey methods, an introduction to epidemiologic study design and animal disease surveillance.

406. Epidemiologic Study Design (3) II.

Lecture—2 hour; laboratory/discussion—3 hours. Prerequisite: course 405 or the equivalent; course 403 or the equivalent (may be taken concurrently). Approved for graduate degree credit. Design and interpretation of clinical trials, case-control, and cohort studies. Critical review of published epidemiologic studies. Principles of association and causality.

407. Analytical Epidemiology (3) III. Kass

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 406 and 404 (may be taken concurrently). Approved for graduate degree credit. Uses of multiple regression, discriminant analysis, factor analysis, path analysis and other multivariate techniques in epidemiology. Approaches for handling the analysis of large data sets.

408. Research Methodology and Research Reports (3) I.

Lecture—1 hour; discussion—2 hours. Prerequisite: enrolled in MPVM degree program or consent of instructor. Approved for graduate degree credit. Application of the experimental method to solving specific epidemiological field problems involving disease of animals. Students must identify and select a problem, and complete all work preparatory to the actual field collection of data or specimens.

409A-409B. Topics in Data Analysis (2-3) II-III. The Staff (Chairperson in charge)

Discussion—2 hours (409A); discussion—3 hours (409B). Prerequisite: course 406 (may be taken concurrently) or consent of instructor. Approved for graduate degree credit. Emphasis on decision making with respect to the type and amount of data required for solving epidemiological problems and the selection and use of appropriate data in statistics and economics for processing, analyzing, and interpreting these data. (Deferred grading only, pending completion of course.)

410A-410B. Topics in Applied Epidemiology (3-2) II-III. The Staff (Chairperson in charge)

Discussion—3 hours (410A); discussion—2 hours (410B). Prerequisite: course 406 (may be taken concurrently) or consent of instructor. Approved for graduate degree credit. Collection of data, and/or specimens from field studies, serum banks or data banks. Laboratory examination of specimens and recording of results. Alternative approaches to presentation of data and conclusions and formulations of recommendation for further investigations. (Deferred grading only, pending completion of course.)

411. Disease Control and Eradication (3) III. Riemann

Lecture—1.5 hours; discussion—1.5 hours. Prerequisite: Veterinary Medicine 409 or course 405. Studies of various approaches to control/eradicate diseases in animal populations. Design and economic evalua-

tion of control programs.

412A. Use of Microcomputers: Level 1 (3) I. Stevens

Lecture—2 hours; laboratory—3 hours. Prerequisite: orientation to microcomputers or consent of instructor. Introduction to and development of skills on modern microcomputers for students involved in epidemiological studies and research. Level one topics include microcomputer anatomy, operating systems, file handling, fundamentals of word processing, spreadsheets, and statistical analysis software. (S/U grading only.)

412B. Use of Microcomputers: Level 2 (3) II. Stevens

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 412A or consent of instructor. Development of intermediate skills on modern microcomputers for students involved in epidemiological studies and research. Level two topics include advanced use of word processing and spreadsheet software, and introduction to database management programs. (S/U grading only.)

412C. Use of Microcomputers: Level 3 (3) III. Stevens

Lecture—1 hour; laboratory—4 hours. Prerequisite: course 412B or consent of instructor. Development of advanced skills on modern microcomputers for students involved in epidemiological studies and research. Level three topics include advanced use of database management programs, and development of application programs to facilitate the students' research efforts. (S/U grading only.)

413. Microcomputer Programs in Epidemiology

(1) II. Gardner
Laboratory—3 hours. Prerequisite: introductory course in epidemiology (course 405 or Veterinary Medicine 409) and basic understanding of MS-DOS and IBM-compatible microcomputers. Applications of EpiInfo to epidemiologic research and disease outbreak investigation, including questionnaire design, data checking and validation, statistical analysis, sample size calculations, and design of a surveillance system (S/U grading only.)

421. Veterinary Public Health (3) III. Chomel

Lecture/discussion—3 hours. Broad coverage of the various functions of the veterinary profession towards human health with special emphasis on zoonoses and major livestock diseases prevention and control, food safety and hygiene and new environmental issues as well as animal welfare.

Psychiatry

See Medicine, School of

Psychology

(College of Letters and Science)

Phillip R. Shaver, Ph.D., Chairperson of the Department

Department Office, 149 Young Hall (916-752-1880)

Faculty

Linda P. Acredolo, Ph.D., Professor, *Academic*

Senate Distinguished Teaching Award

Leo M. Chalupa, Ph.D., Professor

Richard G. Coss, Ph.D., Professor

Alan C. Elms, Ph.D., Professor

Robert A. Emmons, Ph.D., Associate Professor

Karen P. Erickson, Ph.D., Professor

Michael S. Gazzaniga, Ph.D., Professor (*Center for Neuroscience*)

Gail S. Goodman, Ph.D., Professor

Albert A. Harrison, Ph.D., Professor

Kenneth R. Henry, Ph.D., Professor

Joel T. Johnson, Ph.D., Associate Professor
 Neal E.A. Kroll, Ph.D., Professor
 Debra L. Long, Ph.D., Assistant Professor
 George R. Mangun, Ph.D., Assistant Professor
 Peter R. Marler, Ph.D., Professor (*Neurobiology, Physiology and Behavior*)
 Sally P. Mendoza, Ph.D., Professor
 G. Mitchell, Ph.D., Professor
 Robert M. Murphey, Ph.D., Professor
 Thomas Natsoulas, Ph.D., Professor
 Donald H. Owings, Ph.D., Professor
 Theodore E. Parks, Ph.D., Professor
 Robert B. Post, Ph.D., Associate Professor
 Phillip R. Shaver, Ph.D., Professor
 Stephanie A. Shields, Ph.D., Professor
 Dean K. Simonton, Ph.D., Professor
 Robert Sommer, Ph.D., Professor
 Charles T. Tart, Ph.D., Professor
 Carol Tomlinson-Keasey, Ph.D., Professor
 Niels G. Waller, Ph.D., Assistant Professor

Emeriti Faculty

Jarvis R. Bastian, Ph.D., Professor Emeritus
 William F. Duker, Ph.D., Professor Emeritus
 Joseph Lyons, Ph.D., Professor Emeritus
 William A. Mason, Ph.D., Professor Emeritus

The Major Programs

Psychology provides knowledge of and means of studying human and animal behavior.

The Program. The department offers the Bachelor of Arts degree for the student interested in the liberal arts and the Bachelor of Science program designed for students with an interest in either biology or mathematics. The psychology program is extremely broad and represents a wide variety of topics. The courses are organized around three focal points: Personality/Social emphasizes the individual in the social environment and includes such topics as personality theory, social psychology, abnormal psychology, individual differences, developmental psychology, humanistic psychology, and motivation. Psychobiology emphasizes the biological correlates of behavior and includes such topics as sensory psychology, physiological psychology, and comparative psychology. Perception/Cognition emphasizes how information from the physical world is sensed, perceived and used, and examines the roles of consciousness, language, perception, and learning in behavior.

Preparatory Requirements. Before declaring a major in psychology, students must complete the following courses with a combined grade point average of at least 2.50 (all courses must be taken for a letter grade):

- Psychology 1, 418 units
- Statistics 13 or 1024 units
- Biological Sciences 1A
or
Biological Sciences 10
and one course from
Anthropology 1, Molecular and Cellular
Biology 10, Neurobiology, Physiology
and Behavior 105 or 8 units
- Sociology or cultural
anthropology4 units

Career Alternatives. A degree in psychology provides broad intellectual foundations which are useful to the graduate for the development of careers in a variety of areas, including social work, the ministry, teaching, business, and counseling. An undergraduate education in psychology also provides excellent preparation for graduate study. Individuals with degrees in psychology may enter graduate programs to prepare for teaching, research, or clinical/counseling careers in psychology, or may go on to professional schools for training in veterinary and human medicine, law, and other professions.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	21-25
Psychology 1 or the equivalent	4

Psychology 41	4
Statistics 13 or 102	4
Biological Sciences 1A; or a combination of Biological Sciences 10 and one course from Anthropology 1, Molecular and Cellular Biology 10, or Neurobiology, Physiol- ogy and Behavior 10	5-8
One course in sociology or cultural anthropol- ogy (may be lower or upper division), min- imum of 4 units	4-5
(Strongly recommended that Psychology 41, and Statistics 13 or 102 be completed in the first year.)	

Depth Subject Matter	40
Two courses from two of the following three groups and one course from the remain- ing group	21-22
Group A: Psychology 130, 131, 132, 135, 136	136
Group B: Psychology 108, 129, 134, 150 Group C: Psychology 112, 143, 145, 147, 168	168

Additional units to achieve a total of 40 upper
division units in psychology18-19

Total Units for the Major	61-65
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B.S. Major Requirements:

Biology Emphasis UNITS

Preparatory Subject Matter	52-61
Psychology 1 or the equivalent	4
Psychology 41	4
Statistics 13 or 102	4
Mathematics 16A-16B or 21A-21B	6-8
Physics 10 or 5A-5B	4-8
Biological Sciences 1A, 1B	10
Chemistry 2A, 2B	10
Chemistry 8A-8B or 118A-118B or 128A- 128B	6-8
One course in sociology or cultural anthropol- ogy (may be lower or upper division), min- imum of 4 units	4-5
(Strongly recommended that Psychology 41, and Statistics 13 or 102 be completed in the first year.)	

Depth Subject Matter	49
Seven Psychology courses distributed as specified: Group A: two courses from 130, 131, 132, 135, 136	8
Group B: three courses from 108, 129, 134, 150	15
Group C: two courses from 112, 143, 145, 147, 168	8
Additional units to achieve a total of 40 upper division units in psychology	9
Biological Sciences 101	4
Neurobiology, Physiology and Behavior 110	5

Total Units for the Major (Biology Emphasis)	101-110
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Recommended: Psychology 154, 180B, 199 (on a
psychobiological topic), Anthropology 154A, Envi-
ronmental Studies 110, Evolution and Ecology 100,
101.

Mathematics Emphasis UNITS

Preparatory Subject Matter	44-58
Psychology 1 or the equivalent	4
Psychology 41	4
Statistics 13 or 102	4
Mathematics 21A, 21B, 21C,	12
Computer Science Engineering 30 or Engi- neering 5	3
Chemistry 10 or 2A-2B or 2AH-2BH	4-10
Physics 10 or 5A-5B	4-8
Biological Sciences 1A; or a combination of Biological Sciences 10 and one course from Anthropology 1, Molecular and Cellu- lar Biology 10, or Neurobiology, Physiol- ogy and Behavior 10	5-8

One course in sociology or cultural anthropol-
ogy (may be lower or upper division), min-
imum of 4 units

Depth Subject Matter

Five Psychology courses, distributed as spec- ified:	47-48
Group A: two courses from 130, 131, 132, 135, 136	8
Group B: two courses from 108, 129, 134, 150	10
Group C: one course from 112, 143, 145, 147, 168	4
Psychology 103	5
One course from Psychology 105, 206, 207 ...	4
Additional units to achieve a total of 40 upper division units in psychology	9
One course sequence from Statistics 106-108, 130A-130B, 131A-131B	7-8

Total Units for the Major (Mathematics Emphasis)	91-106
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Recommended for All Majors

Psychology 103 is strongly recommended for stu-
dents who plan to do graduate work in any area of
psychology. Psychology 41 is a prerequisite for most
upper division courses. Psychology 41 and Statistics
13 or 102 should be completed in the first year.

Major Advisers. L.P. Acredolo, L.M. Chalupa, R.G.
Coss, R.A. Eder, A.C. Elms, R.A. Emmons, K.P. Erick-
sen, M.S. Gazzaniga, G.S. Goodman, A.A. Harrison,
K.R. Henry, J.T. Johnson, N.E.A. Kroll, D.L. Long, G.R.
Mangun, S.P. Mendoza, G. Mitchell, R.M. Murphey,
T. Natsoulas, D.H. Owings, T.E. Parks, R.B. Post, P.R.
Shaver, S.A. Shields, D.K. Simonton, R. Sommer, C.T.
Tart, C. Tomlinson-Keasey, N.G. Walker.

Honors and Honors Program. In order to be eligible
for high or highest honors in Psychology, the student
must both meet the college criteria and complete a
research project involving a minimum of six units of
course work over at least two quarters which rep-
resents an original analysis of data on psychological
phenomena. Course 194HA-194HB or other approved
courses can be used to satisfy the unit requirement.
This project is to be written in thesis form and
approved by the department. The quality of the thesis
work will be the primary determinant for designating
high or highest honors at graduation.

Minor Program Requirements:

Psychology UNITS

Psychology	24
Psychology 1 or the equivalent	4
One course from each of the following three groups	13
Group A: Psychology 130, 131, 132, 135, 136	136
Group B: Psychology 108, 129, 134, 150- Group C: Psychology 112, 143, 145, 147, 168	168
Additional units to achieve a total of 20 upper division units	7

Graduate Study. The Department offers programs of
study and research leading to the Ph.D. degree in
psychology. Detailed information regarding graduate
study may be obtained by writing the Graduate
Adviser, Department of Psychology.

Graduate Adviser. See *Class Schedule and Room
Directory*.

Courses in Psychology (PSC)

Lower Division Courses

1. General Psychology (4) I, II, III. The Staff
Lecture—4 hours. Introduction emphasizing empirical
approaches. Focus on perception, cognition, person-
ality and social psychology, and biological aspects
of behavior. Only 2 units allowed to those who have
taken course 15 or 16; no credit allowed to those who
have taken both courses 15 and 16.

*Course not offered this academic year.

15. Introductory Psychobiology (3) I, II, III. The Staff
Lecture—3 hours. Survey of genetic, evolutionary and physiological factors affecting behavior. Emphasis on biological and biosocial mechanisms for understanding people and their interaction with their environment. No credit allowed to students who have completed course 1. General Education credit for two-course sequence of non-GE courses (15-16) which will satisfy requirement for one GE course: Contemporary Societies.

16. Psychology and Modern Life (3) I, II, III. The Staff
Lecture—3 hours. Personality development, interpersonal relationships, and the relevance of psychology to social processes. No credit allowed to students who have completed course 1. General Education credit for two-course sequence of non-GE courses (15-16) which will satisfy requirement for one GE course: Contemporary Societies.

***20. Freshman Psychology Seminar** (4) I, II, III. The Staff
Seminar—4 hours. Prerequisite: freshman standing. Instructor will acquaint students with his or her program of research, the development of scientific questions from the literature, and the application of research methods to examine these questions. Critical thinking will be encouraged via expository writing and brief presentations.

41. Research Methods in Psychology (4) I, II, III. Mitchell
Lecture—4 hours. Prerequisite: course 1 or the equivalent; completion of Statistics 13 or 102 strongly recommended. Introduction to experimental design, interviews, questionnaires, field and observational methods, reliability and statistical inference.

90X. Lower Division Seminar (1-2) I, II, III. The Staff
Seminar—1-2 hours. Prerequisite: lower division standing and consent of instructor. Examination of a special topic in Psychology through shared readings, discussions, written assignments, or special activities such as fieldwork or laboratory work. May not be repeated for credit. Limited enrollment.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Primarily for lower division students. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

103. Advanced Research Design and Data Analysis (5) I. Kroll, Johnson, Mitchell
Lecture—5 hours. Prerequisite: course 41 and either Statistics 13 or 102. Design and analysis of psychological investigations and the interpretation of quantitative data in psychology.

104. Applied Psychometrics: An introduction to the Measurement Theory (4) I. Waller
Lecture—4 hours. Prerequisite: course 41 and 103, Statistics 13. Examination of the basic principles and applications of classical and modern test theory. Topics include test construction, reliability theory, validity theory, factor analysis and latent trait theory.

105. Statistical Inference from Psychological Experiments (4) II. Kroll
Lecture—4 hours. Prerequisite: course 41, course 103 or consent of instructor. Probability theory, sampling distributions, hypothesis testing, statistical inference, and nonparametric statistics, with applications in sensory, perceptual, comparative, physiological, and other areas of psychology.

108. Physiological Psychology (5) I, II, III. Chalupa, Henry, Mendoza
Lecture—4 hours; laboratory—2 hours. Prerequisite: courses 1, 41; at least one zoology or physiology course recommended. Relationship of brain structure and function to emotion, motivation, perception, states of consciousness, language, learning, and memory in humans and other animals; introduction to methods of physiological psychology.

112. Developmental Psychology (4) I, II, III. Mitchell, Shields, Acredolo, Eder, Goodman, Tomlinson-Keasey
Lecture—4 hours. Prerequisite: courses 1, 41. An ontogenetic account of human behavior through adolescence with emphasis on motor skills, mental abilities, motivation, and social interaction.

114. Gender and Social Development (4) III. Shields
Lecture—4 hours. Prerequisite: courses 1, 41. Biological and social factors that influence when and how psychological sex-related differences will be expressed in human development. Special attention to the scientific and social rationales which underlie the study of gender.

***115. Maturity and Aging** (4)
Lecture—4 hours. Prerequisite: courses 41, 112. Biological, cognitive, personal, and social aspects of the human life span between early maturity and death, in its theoretical, methodological, and empirical aspects.

***120. History of Psychology** (4)
Lecture—3 hours; term paper. Prerequisite: courses 1, 41; upper division standing or consent of instructor. Development of psychological thought and research in context of history of philosophy and science.

129. Sensory Processes (5) I, II, III. Henry, Mendoza, Mangun
Lecture—4 hours; discussion, project, or term paper—1 hour. Prerequisite: course 1 or Biological Sciences 1B or consent of instructor, and course 41. Psychobiology of sensory systems in man and other animals. Relationship of behavior to physiology, structure and function of the senses.

130. Human Learning and Memory (4) I, II, III. Kroll, Parks, Goodman
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1, 41, and either Statistics 13 or 102; or consent of instructor. Consideration of major theories of human learning and memory with critical examination of relevant experimental data.

131. Perception (4) I, II, III. Natsoulas, Parks, Post
Lecture—3 hours; independent library work. Prerequisite: courses 1, 41. The cognitive organizations related to measurable physical energy changes mediated through sensory channels. The perception of objects, space, motion, events.

132. Language and Cognition (4) I, III. Long
Lecture—4 hours. Prerequisite: course 1 or the equivalent, course 41, and 6 units of upper division work in psychology or linguistics. Zoological, cultural, and individual perspectives of linguistic actions; their production, perception, cognitive significance, and their roles in human conduct, enculturation, and cognitive development.

134. Animal Learning and Motivation (5) II. Coss
Lecture—5 hours. Prerequisite: course 1 or 15 or consent of instructor; course 41. General theories of phyletic differences in learning and motivation drawing upon data from laboratory and field observations. Innate physiological mechanisms, developmental changes, effects of conditioning and other constraints on these processes are examined.

135. Psychology of Consciousness (4) I, II, III. Natsoulas
Lecture—4 hours. Prerequisite: courses 1, 41. Consideration of major theories of consciousness, with critical examination of relevant experimental, clinical, and field data.

136. Cognitive Psychology (4) I, II, III. Kroll, Long
Lecture—3 hours; term paper. Prerequisite: courses 1, 41. Introduction to human information processing, mental representation and transformation, imagery, attention, concept formation, problem solving, and computer simulation.

137. Altered States of Consciousness (4) I. Tart
Lecture—4 hours. Prerequisite: courses 1, 41. Characteristics, uses, and abuses of altered states of consciousness from experiential, behavioral, physiological, and methodological perspectives. Topics typically include sleep, borderline states, dreams,

meditation, hypnosis, autohypnosis, marijuana intoxication, psychedelic drugs, and mystical experiences.

143. Human Emotion and Feeling (4) II, III. Natsoulas, Shields, Shaver
Lecture—4 hours. Prerequisite: introductory psychology course, and course 41. An introduction to current theories and research on emotion and bodily feelings with special reference to self-knowledge.

144. Environmental Awareness (4) I, III. Sommer, Coss
Lecture—4 hours. Prerequisite: course 1. Interactions of people with built environments. Research methods for evaluating designed environments and reviews of current research in environmental psychology.

145. Social Psychology (4) I, II, III. Simonton, Johnson, Shaver
Lecture—4 hours. Prerequisite: courses 1, 41. Behavior of the individual in the group. Examination of basic psychological processes in social situations, surveying various problems of social interaction: group tensions, norm-development, attitudes, values, public opinion, status.

147. Personality Theory (4) I, II, III. Elms, Emmons, Erickson
Lecture—4 hours. Prerequisite: courses 1, 41. The theories of Freud, Erikson, and other major twentieth-century approaches to personality.

149. Gender and Human Reproduction (4) III. Erickson
Lecture—4 hours. Prerequisite: courses 1, 41. The social psychology of human reproduction. Examines gender relations over the course of the individual's reproductive cycle.

150. Comparative Psychology (5) I, II, III. Owings, Mitchell
Lecture—4 hours; discussion or project—1 hour. Prerequisite: course 1 or 15 or consent of instructor; course 41. Perspectives in animal behavior: psychological, ethological, and social systems, with an emphasis on functional behavioral categories from the standpoint of adaptation and evolution.

***154. Primate Psychology** (4)
Lecture—4 hours. Prerequisite: course 41; course 15 or 150 or an equivalent course in biological sciences, and consent of instructor. Comparative survey of primate psychology, based primarily on laboratory experimentation in learning, communication, cognition, sensation, motivation, emotion, perception, and effects of early experience in many species of primates.

160. Health Psychology (4) II. Emmons
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 15, course 41 Psychological factors influencing health and illness. Topics include stress and coping, personality and health, symptom perception and reporting, heart disease, cancer, compliance, and health maintenance and promotion. Application of principles in laboratory exercises.

165. Introduction to Clinical Psychology (4) I, II, III. The Staff
Lecture—4 hours. Prerequisite: courses 1, 41, 168, and either 112 or 145. Major theoretical formulations in the history of clinical psychology, from classical psychoanalysis to contemporary existentialism and behavior modification. A survey, based on lectures, films, and tapes, of what clinical psychologists do, including methods of appraisal, professional roles, and approaches to treatment.

168. Abnormal Psychology (4) I, II, III. Emmons, Murphey, Sommer, Waller
Lecture—4 hours. Prerequisite: courses 1, 41. Descriptive and functional account of behavioral disorders, with primary consideration given to neurotic and psychotic behavior.

171. Humanistic and Transpersonal Psychology (4) I. Tart
Lecture—4 hours. Prerequisite: courses 41; course 165 or the equivalent and consent of instructor. Survey, including lectures and demonstrations, of humanistic, and transpersonal movements in contemporary psychology. Theory, data, and techniques in the work of Maslow and others who emphasize cre-

ativity, self-actualization, and realization of human potential.

175. Genius, Creativity, and Leadership (4) I.

Simonton

Lecture—4 hours. Prerequisite: course 1 or 16; course 41. The phenomenon of genius is examined from a diversity of theoretical, methodological, and disciplinary perspectives, with an emphasis on outstanding creativity and leadership in art, music, literature, philosophy, science, war, and politics. General Education credit: Contemporary Societies.

177. Psychobiography and Life History (4) II, III.

Elms

Lecture—4 hours. Prerequisite: course 1 or 16 or consent of instructor; course 41. Case-history research as a nonquantitative approach to studying personality. Psychological interpretation of life histories of outstanding individuals in the arts, politics, science and other areas. General Education credit: Contemporary Societies.

180A. Research in General Experimental Psychology (4) III. The Staff

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 41, and four upper division Psychology courses and consent of instructor. Empirical research on selected topics in general experimental psychology (general research design and analysis, perception, cognition, cognitive development, etc.). Specific content will vary from quarter to quarter. May be repeated once for credit when the content differs.

180B. Research in Psychobiology (4) III. The Staff

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 41, and four upper division Psychology courses and consent of instructor. Empirical research on selected topics in psychobiology (animal learning and motivation, comparative psychology, physiological psychology, sensory psychology, etc.). Content will vary from quarter to quarter. May be repeated once for credit when the specific content differs.

180C. Research in Personality and Social Psychology (4) II. The Staff

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 41, and four upper division Psychology courses and consent of instructor. Empirical research on selected topics in personality and social psychology (personality, social psychology, organizational psychology, etc.). Content will vary from quarter to quarter. May be repeated once for credit when the specific content differs.

181. Interactive Computer Programming for Psychological Experiments (4) III. Kroll

Lecture—2 hours; laboratory—4 hours. Prerequisite: consent of instructor, course 41 and one of courses 130, 132, or 136. Instruction in programming with an emphasis on programming desk-top computers as an interactive research tool.

183. Organizational Psychology (4) II. Harrison

Lecture—4 hours. Prerequisite: introductory psychology course; course 41. Survey of interrelationships among psychological processes, interpersonal dynamics, and organizational forms. Topics include motivation, communication, decision making, leadership, personnel selection and training, stress and conflict, career development, organizational development, and organization-community relations.

190. Seminar in Psychology (4) I. The Staff

Seminar—4 hours. Prerequisite: junior or senior standing; major in psychology or consent of instructor. Intensive treatment of a special topic or problem of psychological interest. May be repeated for credit in different subject area.

190X. Upper Division Seminar (1-2) I, II, III. The Staff

Seminar—1-2 hours. Prerequisite: upper division standing and consent of instructor. In-depth examination at an upper division level of a special topic in Psychology. Emphasis on student participation in learning. May not be repeated for credit. Limited enrollment.

192. Fieldwork in Psychology (1-6) I, II, III. Mur-

phrey, Sommer

Internship—3-18 hours; term paper. Prerequisite: upper division standing in psychology and consent

of instructor. Supervised internship, off- and on-campus, in community and institutional settings. Credit not applicable toward 40 units of upper division psychology required of majors. May be repeated once for credit. Limited enrollment. (P/NP grading only.)

194HA-194HB. Special Study for Honors Students (3-3) I-II, II-III. The Staff

Independent study—9 hours. Prerequisite: senior standing in Psychology and qualifications for admission into college honors program, and consent of instructor; at least one course from 180A, 180B, 180C or 199 strongly recommended. Directed research. Supervised reading, research and writing leading to submission of a Senior Honors thesis under the direction of faculty sponsor. (Deferred grading only, pending completion of sequence.)

197T. Tutoring in Psychology (1-3) I, II, III. The Staff

The Staff

Prerequisite: upper division standing and consent of instructor. Tutoring in Psychology Department courses. This course is intended for advanced undergraduate students who will lead discussion sections in Psychology courses. May be repeated for credit for a total of 8 units. No more than 6 units may count toward the Psychology major requirement. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

200. Proseminar in Psychology (3) I. The Staff

Seminar—2 hours; independent study—1 hour. Prerequisite: graduate standing in Psychology or consent of instructor. Introduces matriculating graduate students to research activities of departmental faculty. (S/U grading only.)

201. Research Preceptorship (4) I, II, III. The Staff

Laboratory/discussion—6-9 hours. Prerequisite: consent of instructor. (S/U grading only.)

204. Advanced Applied Psychometrics: An Introduction to Measurement Theory (4) I. Waller

Lecture—4 hours. Prerequisite: course 41, 103, Statistics 13. Examination of the basic principles and applications of classical and modern test theory. Topics include test construction, reliability theory, validity theory, factor analysis and latent trait theory.

205. Advanced Statistical Inference from Psychological Experiments (5) II. Kroll

Lecture—5 hours; project and term paper. Prerequisite: graduate student standing and consent of instructor. Probability theory, sampling distributions, nonparametric statistics, statistical inference, and hypothesis testing. A term paper will be required which develops a research proposal with a detailed discussion of the statistical techniques to be employed.

***206. Statistical Analysis of Psychological Experiments III (4)**

Lecture—4 hours. Prerequisite: course 103 or consent of instructor. Statistical analysis of data obtained with various experimental designs; analysis of variance and covariance, factorial and repeated measures, Latin square designs, and tests of trends.

207A. Causal Modeling of Correlational Data (4) II. Simonton

Lecture—4 hours. Prerequisite: course 205, 206 or consent of instructor. Examination of how to make causal inferences from correlational data in the behavioral sciences. Emphasis is on testing rival causal models using correlations among observed variables. Beginning with multiple regression analysis, discussion advances to path analysis and related techniques.

207B. Applied Multivariate Analysis of Psychological Data (4) III. Waller

Lecture—4 hours. Prerequisite: course 205, 207A or consent of instructor. Review of the major methods of multivariate data analysis for psychological data. Students will program statistical routines using a linear

algebra-based computing language. Contemporary methods, such as LISREL, will also be covered.

***208. Physiological Psychology (4) III.** Chalupa,

Henry

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. A conceptual analysis of the contributions of neuroanatomy, neurophysiology and neurochemistry to an understanding of animal and human behavior.

***212. Developmental Psychology (4) I.** Acredolo, Shields, Goodman

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. The original behavioral repertoire of the child and its subsequent development.

***220. History of Psychology (4) III.** The Staff

Lecture—2 hours; seminar—2 hours. Prerequisite: graduate standing in Psychology or consent of instructor. A lecture-seminar on the history of psychology and on the applicability of early psychological theory and research to contemporary investigations. Offered in alternate years.

230. Cognitive Psychology (4) III. Kroll, Long,

Goodman, Mangun, Parks

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Analysis of the mental processes by which knowledge is acquired, manipulated, stored, retrieved and used. Offered in alternate years.

231. Sensation and Perception (4) II. Post

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Analysis of the role of sensory processes and perception in experience and their effects on behavior. Offered in alternate years.

***245. Social Psychology (4) II.** Johnson

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in social psychology.

247. Personality (4) II. Emmons, Erickson

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in human personality.

250. Comparative Psychology (4) I. The Staff

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. The study of animal behavior in an evolutionary and comparative framework.

***251. Topics in Genetic Correlates of Behavior (4)**

II. Murphey, Waller

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and experiment in the genetic contributions to animal and human behavior. May be repeated for credit when topic differs. Offered in alternate years.

252. Topics in Psychobiology (4) II. Chalupa,

Owings, Mendoza

Seminar—4 hours. Prerequisite: graduate standing in Psychology or consent of instructor. Critical study in a selected area of psychobiology. May be repeated for credit when content differs. Offered in alternate years.

263. Topics in Cognitive Psychology (4) I.

Acredolo, Goodman, Kroll, Long, Parks, Post, Tart
Seminar—4 hours. Prerequisite: graduate standing in Psychology or consent of instructor. Selected topics in language processing, memory, perception, problem solving, and thinking, with an emphasis on the common underlying cognitive processes. May be repeated for credit when content differs. Offered in alternate years.

***264. Topics in Psycholinguistics (4) I.** Long

Seminar—4 hours. Prerequisite: graduate standing in Psychology or consent of instructor. Discussion of fundamental issues in the psychology of language. May be repeated for credit when content differs. Offered in alternate years.

***265. Topics in Psychology of Consciousness (4)**

Natsoulas

Seminar—4 hours. Prerequisite: graduate standing in Psychology or consent of instructor. Theory and research in the psychology of consciousness. May be

repeated for credit when content differs. Offered in alternate years.

270. Topics in Personality Psychology (4) III.

Elms, Emmons, Erickson, Shaver
Seminar—4 hours. Prerequisite: graduate standing or consent of instructor. Critical study of a selected area of personality psychology. May be repeated for credit when content differs.

290. Seminar (4) I, II, III. The Staff

Seminar—4 hours. Prerequisite: graduate standing in Psychology or consent of instructor. Seminar devoted to a highly specific research topic in any area of basic psychology. Special topic selected for a quarter will vary depending on interests of instructor and students.

291. Current Research in Psychology (2) I, II, III.

The Staff (Chairperson in charge)
Seminar—2 hours. Prerequisite: graduate standing in psychology or consent of instructor. Topics relevant to current research in psychology will be discussed and methods employed in contemporary research will be evaluated. Students present a seminar on their own research. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
(S/U grading only.)

299. Research (2-9) I, II, III. The Staff
(S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff
Prerequisite: consent of instructor. (S/U grading only.)

Professional Course

390A-390B-390C. The Teaching of Psychology (4-2-4) I, II, III. Murphey
Seminar—2-4 hours. Prerequisite: graduate standing in psychology and consent of instructor. Practical experience in teaching. Methods and problems of teaching psychology at the undergraduate and graduate levels; curriculum design and evaluation. Practical experience in the preparation and presentation of material. (Deferred grading only, pending completion of sequence.)

Radiation Oncology

See Medicine, School of

Radiology

See Medicine, School of

Range and Wildlands Science

See Range and Wildlands Science, below; and Range Science

Range and Wildlands Science

(College of Agricultural and Environmental Sciences)

Admission into the Range and Wildlands Science major is temporarily closed for the academic year 1994-95. Interested students should refer to the Environmental and Resource Science major.

The Major Program

Range and wildlands science is the study of the biological and physical components of land resources which are used mostly for grazing domestic livestock, but which also provide wildlife habitats, watersheds, recreation, and open space.

The Program. The major provides background in the biological, physical, and social sciences. Comprehensive study in the plant, animal, soil, and resource sciences supplements the core of range management courses. Integration of the knowledge of a variety of specialized fields is learned as a basis for land management oriented toward the multiple use concept and the maintenance of environmental quality.

Career Alternatives. Range and wildlands science graduates, especially those with some experience, may be employed as consultants, extension specialists, ranch managers, or ranchers. They may also qualify for the position of Range Conservationist in governmental agencies such as the Forest Service, Soil Conservation Service, and the Bureau of Land Management. If career work with such an agency is desired, it is recommended that trainee or apprenticeship experience with that agency be included in the major program of study as an internship. In addition, the training provided by this major should give an excellent background for natural resource management positions.

B.S. Major Requirements:

(For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. Courses shown without parentheses are required.)

UNITS

English Composition Requirement0-8

See College requirement

Preparatory Subject Matter63-67

Animal science (Animal Science 2)4

Biological sciences (Biological Sciences 1A,

1B, 1C)15

Chemistry (Chemistry 2A, 2B, 8A, 8B)16

Computer science (Agricultural Science and

Management 21, Engineering 5, or Computer Science Engineering 10)3

Economic principles (Agricultural Economics

1, Economics 1A, or 1B)4-5

Geology (Geology 1-1L)4

Mathematics (Mathematics 16A; 16B recommended)3-6

Physics (Physics 1A, 1B)6

Soil science (Soil Science 100)4

Statistics (Agricultural Science and Management 150)4

Breadth/General Education6-24

Satisfaction of General Education

requirement to include two non-introductory

courses in Agricultural Economics,

Economics, Environmental Studies, or

Geography

Depth Subject Matter51-56

Plant physiology (Botany 111 or Water Science 104)3-4

Plant ecology (Botany 117 or Plant Science 101)4

Meteorology (Geography 3, Atmospheric Science 105)3-4

Soil science, two upper division courses ...6-8

Watershed management (Water Science 141)3

Animal nutrition (Nutrition 115)4

Wildlife ecology or management, one upper

division course in wildlife and fisheries

biology, or zoology3-4

Forage crops (Agronomy 112)3

Select units from Range Science:18

Range and wildland plants (Range Science 100)

Range ecology (Range Science 133,

134, 135)

Range field course (Range Science 105)

Range livestock production (Range Science 160)

Revegetation of disturbed lands (Range Science 145)

Range Science 192, 198, 199 (not more

than a total of 3 units can be counted)

Aerial photo interpretation and remote sensing

(Geography 106)4

Restricted Electives6-8

Two upper division natural science or

applied biological science courses in one

or two of the following: animal science,

botany, entomology, genetics, geogra-

phy, mathematics, nematology, plant

pathology, plant science, environmental

and resource sciences, water science, or

weed science.

Unrestricted Electives17-47

Total Units for the Major190

Major Adviser. Contact department office.

Advising Center for the major is in 133 Hunt Hall.

Graduate Study. See under Ecology Graduate

Group.

Range Science

(College of Agricultural and Environmental Sciences)

Faculty. See under the Department of Agronomy and Range Science.

Related Courses. See Agricultural Systems and Environment 101, 112, Nutrition 115, Soil Science 105, 120, Wildlife and Fisheries Biology 151.

Courses in Range Science (RMT)

Questions pertaining to the following courses should be directed to the instructor or to the Advising Center, 132 Hunt Hall.

Lower Division Course

92. Range Science Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge) Internship—3-36 hours. Prerequisite: consent of instructor. Work experience off or on campus in all subject areas pertaining to range management. Internships supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Range and Wildland Plants (4) III. Rice
Lecture—2 hours; laboratory—6 hours; two Saturday field trips. Prerequisite: Biological Sciences 1C and junior standing recommended. Systematics, evolution, ecology and use of plants within range and wildland ecosystems. Taxonomy and identification of range and wildland grasses, woody perennials, legumes, and forbs.

***105. Field Course (2) III. Menke**
Lecture—10 hours total; laboratory—30 hours total (given week following end of spring quarter). Prerequisite: course in plant or range ecology. Field studies of rangeland vegetation as a livestock grazing resource and as wildlife habitat. Range management and improvement strategies for enhancing multiple-use carrying capacity: grazing systems, water

developments, seeding of improved species, and prescribed fire. Considered a spring quarter course for preenrollment. Offered in alternate years.

***133. Grassland Ecology** (3) II. The Staff
Lecture—3 hours; one Saturday field trip. Prerequisite: course in plant ecology or consent of instructor. Structure, function and environment of North American grasslands, with emphasis on the California annual type. Concepts and problems in measuring primary and secondary productivity. Principles of grassland and management including vegetation improvement, utilization by animals, and recreation and aesthetic values. Offered in alternate years.

134. Comparative Ecology of Major Rangeland Systems (3) II. Menke
Lecture—3 hours; one Saturday field trip. Prerequisite: course 100 or the equivalent; general ecology course recommended. Study of vegetation structure, composition, and succession in representative North American rangeland plant communities. Description and comparison of interactions between vegetation and grazing animals on grassland, desert, forested, and tundra rangelands. Discussion of management strategies used in these systems today. Offered in alternate years.

135. Ecology and Community Structure of Grassland and Savanna Herbivores (3) I. Demment
Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, or the equivalent; general ecology course recommended. Feeding ecology of grassland herbivores and its importance in evolution of herbivore communities and social systems. Optimal foraging, interspecific interactions, and primary productivity are considered as factors structuring natural and managed grassland and savanna systems. Offered in alternate years.

192. Range Science Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off or on campus in all subject areas pertaining to range management. Internships supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Department Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Department Chairperson in charge)
Prerequisite: senior standing and consent of instructor. (P/NP grading only.)

Graduate Courses

***208. Computer Modeling in Range and Crop Management** (3) I. The Staff
Lecture—3 hours. Prerequisite: one course from Agronomy 205B, Agricultural Science and Management 121, Animal Science 128, or Environmental Studies 128. Development of computer models involving dynamic simulation and optimization modes for range and crop management problems. Modeling philosophy, assumptions, implementation, validation, and experimentation emphasized. Offered in alternate years. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Religious Studies

(College of Letters and Science)
Walen W. Lai, Ph.D., Program Director
Program Office, 922 Sproul Hall (916-752-9932)

Committee in Charge

John R. Hall, Ph.D. (*Sociology*)
Lincoln D. Hurst, Ph.D. (*Religious Studies*)
Naomi Janowitz, Ph.D. (*Religious Studies*)
Phyllis Jestice, Ph.D. (*History*)
Whalen Lai, Ph.D. (*Religious Studies*)
Jay Mechling, Ph.D. (*American Studies*)
Jacob Olupona, Ph.D. (*African American and African Studies*)
Aram A. Yengoyan, Ph.D. (*Anthropology*)

Faculty

Lincoln D. Hurst, Ph.D., Associate Professor
Naomi Janowitz, Ph.D., Associate Professor
Whalen W. Lai, Ph.D., Professor
Barbara Metcalf, Ph.D., Professor (*History*)

The Major Program

Majoring in religious studies provides an opportunity to explore and analyze the great written and oral traditions of the world's religions: Eastern (Hinduism, Buddhism, Taoism, Confucianism), Western (Judaism, Christianity, Islam), ancient (Egypt, Mesopotamia) and modern (contemporary religious groups in the U.S.).

The Program. The religious studies major offers a broad choice of courses including history, philosophy, sociology, anthropology, American studies, classics, and medieval studies. For some students, religious studies is an appropriate second major and might combine well with anything from philosophy to international agricultural development, from history to international relations. The religious studies program has also designed four options for minor programs: religious studies, oriental religions, Judaism, and Christian studies.

Career Alternatives. The emphasis in religious studies courses on developing analytical thinking skills and clear written expression is an asset for many career goals. As a strong liberal arts program, the major can lead to research and/or teaching on all levels, as well as careers in related areas such as the ministry, counseling, social work, and other helping professions. Because the major integrates so many academic areas, it is also an excellent background for graduate programs, especially in the humanities, and for professional schools including law, business, and foreign service.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24
Religious Studies.....	20
At least one course from each of the following groups:	
(a) Religious Studies 1, 2	
(b) Religious Studies 21, 23, 40, 60, 70, 75	
Additional requirements	4
Anthropology 2 or, with approval from adviser, a lower division course related to religion from Philosophy, Native American Studies, African American and African Studies, American Studies, or other departments	
Depth Subject Matter	40
Religious Studies.....	24
Five upper division courses plus Religious Studies 100 to be taken in junior/senior year	
History.....	8
Two upper division courses related to religion	

Sociology, philosophy, anthropology.....8
Two upper division courses related to religion in the above disciplines such as Philosophy 105, 145, Sociology 146, 149, Anthropology 124; or, with approval from adviser, in other disciplines such as Medieval Studies, Native American Studies, African American and African Studies, Classics, or other departments

Total Units for the Major.....**64**

Course Equivalents

The major advisers have a list of lower and upper division courses that can be substituted for courses suggested above.

Recommended

A reading knowledge of a foreign language is highly recommended. Consult major adviser for a complete list of recommended upper division courses.

Major Advisers. W.W. Lai, N. Janowitz, L. Hurst.

Minor Program Requirements:

The following four minor program options and others responsive to students' needs are subject to approval by the major adviser or the Curriculum Committee. The four areas of emphasis are Religious Studies, Oriental Religions, Judaism, and Christian Studies.

UNITS

Religious Studies	20
Lower division course.....	4
Upper division courses†	16
Religious Studies 100 required.	
†Some substitutions from other departments or programs allowed with consent of adviser.	

Preministerial Training

Seminaries and professional theological schools, as a rule, do not prescribe any specific major program and give equal consideration to all qualified applicants completing a course of study that gives them a broad cultural background. A program combining the Preparatory Subject Matter for the A.B. degree in Religious Studies, with one of the A.B. degree curricula in the College of Letters and Science is an excellent preparation for most seminaries and professional theological schools. A reading knowledge of a foreign language is highly recommended.

Students interested in applying for admission to a theological school should consult the Religious Studies office and make an appointment with the preministerial adviser.

Students are encouraged to take as part of their preministerial training one of the canonical languages: Hebrew, Greek, or Latin.

Preministerial Adviser. L. D. Hurst.

Courses in Hebrew (HEB)

Lower Division Courses

1. Elementary Classical Hebrew (5) I. The Staff
Lecture—4 hours; discussion—1 hour. Introduction to Hebrew alphabet, basic vocabulary, orthography, morphology and syntax. Readings from the Bible. (Students who have successfully completed, with a C- or better, Hebrew 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Classical Hebrew (5) II. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Hebrew alphabet, basic vocabulary, orthography, morphology and syntax. Readings from Hebrew Bible. Continuation of course 1.

3. Elementary Classical Hebrew (5) III. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Hebrew alphabet, basic vocabulary, orthography, morphology and syn-

*Course not offered this academic year.

tax. Readings from Hebrew Bible and from post-Biblical Hebrew texts. Continuation of course 2.

Courses in Religious Studies (RST)

Lower Division Courses

1. Survey of Religion (4) III. Lai and staff
Lecture—3 hours; discussion—1 hour. Basic concepts introduced through readings of the primary religious literature. Discussion of central ideas (creation, history, law, prophecy, suffering, mysticism, asceticism, karma, reincarnation, moksha, etc.); readings from the Bible, Bhagavad Gita, the Koran, selections from Plato and early Buddhist writings. General Education credit: Contemporary Societies.

2. Myth, Ritual, and Symbolism (4) I, III. Lai, Janowitz

Lecture—3 hours, discussion—1 hour. Myths, rituals and religious symbols found in a variety of religious traditions including examples from ancient and contemporary religious life. Variety of religious phenomena; validity of different approaches to the study of religion. General Education credit: Contemporary Societies.

3A-C. Topics in Comparative Religion (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Introduction to the methods used in comparative religion, focusing on a particular theme in a number of religious traditions: ***(A)** The Experiential Dimension: Pilgrimage; **(B)** The Mythic Dimension: Death and the After-life; ***(C)** The Ritual Dimension: Sacrifice. May be repeated for credit in a different subject area. General Education credit for 3A, 3B, 3C: Civilization and Culture.

***4. Eastern Religions (4)** I. Lai

Lecture—3 hours; discussion—1 hour. Eastern religions, including Hinduism, Buddhism, and Taoism from their origins to the present.

10. Introduction to Religious Studies (2) II. Lai

Lecture—2 hours. Topic of importance in more than one religious tradition as an illustration of the problems and methods of religious studies. May be repeated for credit in a different subject area.

21. Old Testament (4) I. Janowitz and staff

Lecture/discussion—4 hours. Religion of Ancient Israel from the time of Abraham to the post-exilic period, as contained in the Hebrew Bible. Emphasis on such key Biblical themes and institutions as: monotheism, revelation, law, covenant, holiness, creation, prophecy, priesthood, wisdom, and apocalypse. General Education credit: Civilization and Culture.

23. Introduction to Judaism (4) II. Janowitz

Lecture/discussion—3 hours; term paper. Introduction to the study of religion using examples from the rituals, art and holy texts of Judaism. No prior knowledge of either Judaism or the study of religion is necessary. General Education credit: Civilization and Culture.

40. New Testament (4) I. Hurst

Lecture—3 hours; discussion—1 hour. New Testament literature from critical, historical, and theological perspectives. General Education credit: Civilization and Culture.

***60. Introduction to Islam (4)** III. Metcalf

Lecture/discussion—4 hours. Introduction to topics at core of Islamic tradition including Muhammad, the Qur'an, Islamic law, Sufism and sects as well as to selected topics including Islamic revival.

***70. Introduction to Buddhism (4)** I. Lai

Lecture—3 hours; term paper (30 hours minimum preparation). Lectures, readings, and discussions on the development of Buddhism in India, China, and Japan; its influence on various Far Eastern art forms.

***75. Chinese Philosophy: An Introduction (3)** II. Lai

Lecture—2 hours; discussion—1 hour. Introduction to Chinese philosophy from classical to modern times: emphasis on basic metaphysics and its change over time, including Confucian humanism, Taoist cosmologies, the Han synthesis of Tao, Yin-yang and Five Ele-

ments; its impact on Buddhism, Sung new synthesis and conflict with the West. Offered in alternate years.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.)

99. Special Study for Lower Division Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Upper Division Courses

***100. Study of Religion: Issues and Methods (4)** III. Janowitz

Lecture—3 hours; term paper. Principal issues and methods of Religious Studies and associated fields.

102. Christian Origins (4) I. Hurst

Lecture/discussion—3 hours; term paper. Prerequisite: course 40; course 23 recommended. Beginning of the Christian faith seen in relation to milieu in which it originated. Offered in alternate years.

***110. Life, Meaning and Identity (4)** II. Lai

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 2 or upper division standing. Study of religious lives, the quest for meaning and for personal identity; how religions frame the problems of life; how cultural and personal crises affect youthful identity; the nature and structure of dreams, myths, and ideals. Offered in alternate years.

***115. Mysticism (4)** I. The Staff

Lecture/discussion—4 hours. Prerequisite: one lower division Religious Studies course (except 10, 98, or 99). Course intended primarily for Religious Studies majors, with others admitted. Historical and descriptive analysis of selected mystical traditions, and of selected key figures; readings of representative mystical authors.

***122. Studies in Biblical Texts (4)** III. Janowitz

Lecture—3 hours; term paper. Prerequisite: course 21. Study of a book from the Prophets or writings from critical, historical, and religious perspectives. May be repeated once for credit in different subject area.

124. Topics in Judaism (4) III. Janowitz

Lecture—3 hours; term paper. Prerequisite: course 23. Examination of selected aspects of Jewish life, religion, or literature. May be repeated once for credit in different subject area.

130. Topics in Religious Studies (4) II, III. The Staff (Chairperson in charge)

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 2 or consent of instructor. Thematic study of a phenomenon in more than one religious tradition or of the relationship between religion and another cultural phenomenon; review of theory and method included. May be repeated twice for credit in different subject area.

140. Christian Theology (4) III. Hurst

Lecture/discussion—3 hours; term paper. Prerequisite: course 40; course 102 recommended. Historical and systematic introduction to Christian doctrine, with attention to divergent traditions and the problem of orthodoxy and heresy.

***141A. New Testament Literature: Synoptic Gospels (4)** II. Hurst

Lecture—3 hours; discussion—1 hour. Prerequisite: course 40. Life and thought of the early Church as reflected by the Synoptic Tradition—Matthew, Mark, Luke and Acts. Offered every third year to alternate with 141B, 141C. General Education credit: Civilization and Culture.

***141B. New Testament Literature: John (4)** III. Hurst

Lecture—3 hours; discussion—1 hour. Prerequisite: course 40. Life and thought of the early Church as reflected by the Johannine Tradition—the Gospel and letters of John. Offered every third year to alternate with 141A, 141C. General Education credit: Civilization and Culture.

141C. New Testament Literature: Paul (4) II. Hurst

Lecture—3 hours; discussion—1 hour. Prerequisite: course 40. Life and thought of the early Church as reflected by the Pauline tradition—the letters of Paul. Offered every third year to alternate with 141A, 141B. General Education credit: Civilization and Culture.

142. Tyndale and the Beginnings of the English Bible (4) I, II. Schaeffer

Lecture/discussion—3 hours; term paper. Prerequisite: course 40 recommended. Study of Tyndale's *New Testament* translation as a literary and cultural monument in the context of previous Biblical translation, the historical situation in the 16th century, and the influence of this version on the English language and its literature. Offered in alternate years. General Education credit: Civilization and Culture.

***145. Contemporary American Religion (4)** II. Hurst

Lecture—3 hours; discussion—1 hour. Prerequisite: course 40 and History 17B recommended. Examination of several major movements and phenomena in twentieth-century American religion. Offered in alternate years.

150. Religious Ethics (4) II. Lai

Lecture/discussion—4 hours. Prerequisite: course 4. Study of the religious bases to ethics through concentration on the ethical tracts of one major tradition, or through a comparison of the attitudes of two or more traditions to a common ethical issue. Offered every three years.

***168. Hinduism (4)** I. The Staff

Lecture—3 hours; term paper. Prerequisite: course 4. Hindu tradition from ancient to modern times. Multiplicity of religious forms within Hinduism with mention of Jainism, Buddhism, and Sikhism and their relation to the mainstream of Hindu religion. Offered in alternate years.

170. Buddhism (4) I. Lai

Lecture/discussion—3 hours; term paper. Study of Buddhism in its pan-Asian manifestations, from its beginning in India to its development in Sri Lanka and Southeast Asia, Central Asia, China and Japan; teachings and practices, socio-political and cultural impact. Offered in alternate years.

172. Ch'an (Zen) Buddhism (4) II. Lai

Lecture/discussion—3 hours; term paper. Prerequisite: course 4 recommended. Doctrines and methods of the Patriarchs and great masters, both ancient and modern, in the framework of the orthodox Buddhist tradition. Doctrinal basis of meditational techniques.

178A-E. Undergraduate Proseminar in Religion and Culture (2) I. Castelfranco

Lecture/discussion—2 hours. Prerequisite: upper division standing and one course in religious studies or consent of instructor. Individual topics are discussed by lecturers from this campus and elsewhere. Each student writes a term paper in one of these areas. Content alternates among the following: ***(A)** Idioms of Religion, ***(B)** Cultural and Social Context of Religion, ***(C)** Religion and Mind, ***(D)** Religion and Visual Arts, ***(E)** Religion, Music, and Drama. (P/NP grading only.)

189. Senior Colloquium (4) II. The Staff (Chairperson in charge)

Seminar—3 hours; term paper. Prerequisite: consent of instructor. Primarily for seniors in Religious Studies. Discussion in depth of a problem in religion which requires the methods of several disciplines and is important in the encounter between religions.

194HA-194HB. Special Study for Honors Students (1-5) I, II, III. The Staff (Director in charge)

Independent study. Open only to majors of senior standing who qualify for honors program. Guided research, under the direction of a faculty member approved by the Program Director, leading to a senior honors thesis on a religious studies topic. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Rhetoric and Communication

(College of Letters and Science)

John L. Vohs, Chairperson of the Department

Department Office, 233 AOB 4 (916-752-1222)

Faculty

Don P. Abbott, Ph.D., Associate Professor
Rina Alcalay, Ph.D., Associate Professor
Robert A. Bell, Ph.D., Associate Professor
Charles R. Berger, Ph.D., Professor
Carole Blair, Ph.D., Associate Professor
Michael T. Motley, Ph.D., Professor
Kent Ono, Ph.D., Assistant Professor
John L. Vohs, M.A., Senior Lecturer

Emeriti Faculty

James J. Murphy, Ph.D., Professor Emeritus, *Academic Senate Distinguished Teaching Award*
Ralph S. Pomeroy, Ph.D., Professor Emeritus

The Major Program

The major in rhetoric and communication centers on human beings as communicators, on the ways in which messages and their uses influence our lives.

The Program. The program of study in rhetoric and communication examines communication from several points of view. Courses are offered which deal with both historical and contemporary perspectives. Other classes focus on language and the symbolic components of messages. Persuasion and argumentation are studied as well. In addition, it is important to examine communication as it occurs in various kinds of social settings, and therefore the department also offers courses in public communication, mass communication, interpersonal communication, and organizational communication.

Career Alternatives. Rhetoric and communication graduates have found careers in such fields as broadcast and print journalism, administration, sales, management, politics and government, education, social work, and public relations. A rhetoric and communication degree is also excellent preparation for law school or other graduate programs.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter8
Rhetoric and Communication 1, 3.....8

Depth Subject Matter44
Rhetoric and Communication 110, 114, 115, 12016

Two courses from each of the following three groups24

(a) *Interpersonal communication:*

Rhetoric and Communication 103, 105, 130, 134, 135, 136, 138, 152;

(b) *Rhetoric:* Rhetoric and Communication 113, 121, 122, 124, 125, 126, 151;

(c) *Mass communication:* Rhetoric and Communication 140, 141, 143, 145, 152.

One additional upper division course in Rhetoric and Communication4

Total Units for the Major52

Letter Grades. Courses to satisfy major requirements should be taken with letter grades, except for variable unit courses.

Major Advisers. Faculty (contact department).

Advising Office. Room 229, AOB 4

Minor Program Requirements:

UNITS

Rhetoric and Communication24

One course from Rhetoric and Communication 1, 3, 50.....4

A coherent sequence of at least five upper division courses in rhetoric and communication selected with the approval of a minor adviser.....20

Graduate Study. The Department of Rhetoric and Communication offers programs of study and research leading to the M.A. degree in Rhetoric and Communication. Detailed information may be obtained from the Graduate Adviser, Department of Rhetoric and Communication.

Graduate Adviser. D. P. Abbott.

Courses in Rhetoric and Communication (RCM)

Subject A. Students must have passed the Subject A requirement before taking any course in Rhetoric and Communication.

Lower Division Courses

1. Introduction to Public Speaking (4) I, II, III. The Staff (Chairperson in charge)

Lecture—1 hour; discussion—3 hours. Practice in the preparation and delivery of speeches with an introduction to rhetorical theory and criticism as applied to public address.

3. Group Communication (4) I, II, III. The Staff (Chairperson in charge)

Lecture/discussion—4 hours. Study of communication in small group situations. Role of communication in various group processes, including leadership and decision-making. Participation in group activities and simulation exercises.

***50. Introduction to Argument** (4) II, III. The Staff

Lecture—4 hours. Introduction to the rhetoric of argumentation. Emphasis on critical analysis and construction of effective arguments. Study of various standards for evaluating arguments.

***90X. Lower Division Seminar** (1-4) I, II, III. The Staff (Chairperson in charge)

Seminar—1-4 hours. Prerequisite: lower division standing and consent of instructor. Examination of a special topic in Rhetoric and Communication through shared readings, discussions, written assignments, or special activities such as fieldwork, laboratory work, etc. May *not* be repeated for credit. Limited enrollment.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

103. Analysis of Message Systems (4) I, III. The Staff

Lecture—4 hours. Examination of elements of the communication process, including sources, messages, media, and receivers. Study of the role of these elements as they are influenced by various communicative situations.

105. Semantic and Pragmatic Functions of Language (4) I. Motley

Lecture—4 hours. Prerequisite: course 115. The role of language in shaping attitudes and perceptions of self and others. The use and abuse of verbal symbols in communicative situations. Concepts of meaning in discourse.

110. Origins of Rhetoric (4) II. Abbott

Lecture/discussion—4 hours. Prerequisite: course in ancient history recommended. Issues in the development of rhetoric from its origins in ancient Greece to A.D. 430. Special attention to works of Plato, Aristotle, Cicero, and Quintilian. Role of grammar and rhetoric in schools of Roman Empire. The Christian rhetoric of Saint Augustine. General Education credit: Civilization and Culture.

113. Current Humanistic Trends in Rhetorical Theory (4) III. Ono

Lecture—4 hours. Contemporary developments in traditional rhetorical concepts such as style, meaning, theory of argument, and persuasion.

114. Contemporary Theories of Human Communication (4) II, III. The Staff

Lecture/discussion—4 hours. Rhetoric as a social science, characteristics of social theories, components of theories, development and testing of hypothesis, general models, theories, and research.

115. Empirical Methods in Communication (4) I.

The Staff; III. Bell

Lecture—4 hours. Interpretation of formal and informal scientific reports via the logic and methods of scientific inquiry, with emphasis on experimental and descriptive research in communication.

120. Rhetorical Criticism (4) I. Blair; III. The Staff

Lecture—4 hours. Survey of critical methods and their use in the interpretation of rhetorical discourse.

***121. Public Address in Western Culture** (4) II.

Lecture/discussion—4 hours. Notable and representative speeches from antiquity to the present. Speeches are examined both as dynamic and significant events in their historical contexts, and as noted instances of rhetorical art.

122. Public Discourse in American Culture (4) II.

The Staff

Lecture—4 hours. Major individuals, movements, and media. Case studies of rhetoric as it has contributed to and is influenced by American culture. Variable content; may be repeated once for credit.

124. Rhetoric of Social Issues (4) I, II. The Staff

Lecture—4 hours. Overview of nature and function of rhetoric in public controversy. Analysis and evaluation of argumentative discourses and other rhetorical strategies used in the social issues and movements. Study of how rhetoric structures and informs opinions on controversial matters in the public realm.

125. Freedom of Speech (4) II. Abbott

Lecture/discussion—4 hours. Historical developments of and contemporary controversies in freedom of speech. Political dissent, symbolic speech, slander and obscenity. Offered in alternate years.

126. Rhetorical Criticism Practicum (4) I. Ono; III.

The Staff;

Lecture—4 hours. Prerequisite: course 120. Practice in critical analysis and evaluation of rhetorical events. Application of various critical theories and perspectives in understanding rhetorical situations, genres, ideological positions, effects, and language functions.

130. Group Communication Processes (4) II. Vohs

Lecture—4 hours. Examination of current theories of group formation, goals, structure, and leadership, as they relate to communication processes.

134. Interpersonal Communication (4) I, III. Motley

Lecture—4 hours. Prerequisite: course 1, 3, or 10, or the equivalent. Communication between two individuals in social and task settings. One-to-one communication, verbal and nonverbal, in developing relationships. Consideration of theory and research on relevant variables such as shyness, self-disclosure, reciprocity, games, and conflict.

135. Nonverbal Communication (4) III. Berger

Lecture—4 hours. Examination of the interaction between nonverbal communication and verbal communication channels in influencing outcomes in interpersonal and mass mediated communication contexts. Underlying functions served by nonverbal communication will also be considered.

136. Organizational Communication (4) I, II. Vohs

Lecture—4 hours. Examines communication in various organizational situations. Focuses on the use of effective communication strategies for achieving organizational and individual goals. Emphasis is placed on identifying and amending ineffective communication within organizations.

***138. Communication and Cognition** (4) I. Berger

Seminar—4 hours. Prerequisite: upper division standing. Relationships between communication and cognition. Models of discourse comprehension and production, the influence of language attitudes on

social judgments, and the effects of information processing on decision making are explored. Offered in alternate years.

140. Mass Communication and the Public (4) II, III. The Staff

Lecture—4 hours. Current issues in mass communications policy, with emphasis on the broadcast media. Examination of the economic and legal influences on media performance; the role of public broadcasting; the social impact of technological advances, including cable television and communication satellites.

141. Mass Communication Theory and Research (4) III. Alcalay

Lecture—4 hours. Prerequisite: course 115, or the equivalent course in social science research methods. Recent developments in the study of mass communications content and effects, with emphasis on the broadcast media. Special attention to the function of television for selected audiences: children, minorities, the aged.

***142A. News Policies and Practices in Television (2) II.** The Staff (Chairperson in charge)

Lecture—2 hours. Prerequisite: course 140 or 141, or consent of instructor. Processes and constraints in gathering, editing and reporting the news in the broadcast media, as examined by a practicing professional.

***142B. News Policies and Practices in the Press (2)**

Lecture—2 hours. Prerequisite: course 140 or 141, or consent of instructor. Processes and constraints in gathering, editing, and reporting the news in the print media, as examined by a practicing professional.

143. Media Criticism: Broadcast (4) II. The Staff

Lecture—1 hour; discussion—3 hours; one or two major writing assignments. Analysis, interpretation and evaluation of broadcast media content, employing various critical frameworks including genre studies, mythological and dramaturgical criticism, linguistic analysis, iconographic criticism, and theories of popular culture.

145. Mass Communication and Social Change (4) I. Alcalay

Lecture—4 hours. Prerequisite: course 115 or the equivalent. Study of communication campaigns as a way to effect social change. Effect on people's behaviors which occur via mass media and interpersonal communication channels. Focus on theory and practice of campaigns in such areas as health, intercultural and international communication.

151. Methods of Advocacy (4) II. The Staff

Lecture—4 hours. Prerequisite: course 51 or consent of instructor. Study and practice of methods involved in the effective advocacy of positions on current controversial issues. Relation of inquiry and explanation to advocacy. Consideration of logical and nonlogical means of persuasion.

152. Theories of Persuasion (4) I, II. Bell

Lecture—4 hours. Prerequisite: course 114 or 115 recommended. Theory and research on the effectiveness of various communicative techniques used to influence the perceptions and behaviors of others. Focuses on scientific research into the processes of persuasion and resistance to persuasion in various contexts.

***180. Current Topics in Rhetoric (4) II, III.** The Staff Seminar—4 hours. Prerequisite: upper division standing with a major in Rhetoric and Communication or consent of instructor. Group study of a special topic in Rhetoric and Communication. May be repeated once for credit. Enrollment limited.

***190X. Upper Division Seminar (1-4) I, II, III.** The Staff (Chairperson in charge)

Seminar—1-4 hours. Prerequisite: upper division standing and consent of instructor. In-depth examination at an upper division level of a special topic in Rhetoric and Communication. Emphasis upon student participation in learning. May not be repeated for credit. Limited enrollment.

192. Internship in Rhetoric and Communication (1-6) I, II, III. The Staff

Internship—3-18 hours. Prerequisite: declared major

in Rhetoric and Communication and 20 units of upper division Rhetoric and Communication courses. Work-research projects, usually at off-campus sites under departmental supervision. May be repeated for credit up to 12 units. Units do not count toward major requirement. (P/NP grading only.)

194H. Senior Honors Thesis (4) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour; individual tutoring on research project—3 hours. Prerequisite: senior standing and approval by Honors Committee. Directed reading, research, and writing culminating in the preparation of honors thesis under direction of faculty adviser.

197T. Tutoring in Rhetoric and Communication (2-4) I, II, III. The Staff (Chairperson in charge)

Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing with major in Rhetoric and Communication and consent of Department Chairperson. Tutoring in undergraduate Rhetoric and Communication courses, including leadership in small voluntary discussion groups affiliated with departmental courses. May be repeated for credit up to six units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

Seniors may take graduate courses with consent of instructor.

210. Contemporary Rhetorical Theory (4) III. Abbott

Lecture—4 hours. Prerequisite: upper division course in rhetorical theory/criticism or the equivalent. Rhetorical thought in the twentieth century. Processes of rhetorical invention, arrangement, style, and delivery in the works of Kenneth Burke, I.A. Richards, Richard Weaver, Chaim Perelman, and Stephen Toulmin.

212. Practices of Inquiry in Rhetoric (4) I. Blair

Seminar—4 hours. Prerequisite: graduate standing in Rhetoric and Communication. Examines alternative modes of inquiry in contemporary rhetorical studies. Explores both philosophical groundings and political entailments of research and writing standards and practices.

213. Theory Development in Communication Inquiry (4) II. The Staff

Seminar—4 hours. This course explores meta-theoretical approaches to developing social-scientific theories of human communication. Perspectives include covering-laws, systems, rules, axiomatic theory construction, causal modeling, scientific realism and grounded theory. Research design and measurement implications of these perspectives are examined.

***214. Mass Communication Theory and Research (4) III.** Alcalay

Seminar—4 hours. Prerequisite: course 220 or the equivalent. Examines the basic theories, models, and assumptions of mass communication. Reviews the current state of this discipline and major research developments. Special emphasis on research regarding media and violence, women and minorities, political communication, and new technologies.

***215. Mass Communication and Social Change (4) I.** Alcalay

Seminar—4 hour. Prerequisite: course 220 and 214, or the equivalent. To gain an understanding of current theories and concepts in persuasion and mass communication. To explore how principles of persuasion are used in communication campaigns. To acquire skills in the planning, implementation, and evaluation of campaigns. Offered in alternate years.

220. Empirical Methods in Communication (4) II. Motley

Lecture—4 hours. Prerequisite: course 115 or consent of instructor. Introduction to the use of experimental and descriptive research methods in communication research. Topics include survey research, interviewing, experimental and quasi-experimental design, and statistics.

222. Practicum in Rhetorical Criticism (4) II. Blair Seminar—4 hours. Prerequisite: course 120, an equivalent course in criticism, or consent of instructor. Analysis of selected persuasive messages. Particular attention to the rhetorical situation and to elements in the rhetorical process.

***240. Advocacy in Contemporary Society (4) III.** The Staff

Seminar—4 hours. Prerequisite: course 151 or the equivalent. Rhetorical and communication theories of argumentation and advocacy stance. Analysis of the persuasive impact of argumentation occurring in current public controversies. Offered in alternate years.

***242. Proseminar in Symbolic Behavior (4) II.**

Seminar—4 hours. Prerequisite: course 220. Examination of language and/or other symbolic codes in communication. Investigated phenomena may include stylistic variation, speech arts, cognitive processing, communication rules, and audience effects. Offered in alternate years.

***243. Persuasion Theory (4) III.** Bell

Lecture/seminar—4 hours. Prerequisite: course 152, 212, or consent of instructor. Major scientific theories of persuasion. Research programs related to persuasion theories.

***244. Organizational Communication (4) II.** Vohs

Seminar—4 hours. Prerequisite: graduate standing and consent of instructor. Theory and research on communication processes in organizations.

***245. Classical Rhetorical Theory (4) II.** Abbott

Lecture-seminar—4 hours. Prerequisite: course 110 or the equivalent. Recurrent issues in Greek and Roman rhetorical theory, particularly those in the works of Plato, Aristotle, Cicero, and Quintilian. Special attention to problems of invention and style. Frequent seminar reports involving propositions derived from readings.

***246. Perspectives on Relational Communication (4) II.**

Seminar—4 hours. Prerequisite: course 212. Critical survey of the current state of inquiry on communication in personal relationships, i.e., friendship, romantic, and marital relationships. Issues examined include the role of communication in constructing, maintaining, and dissolving relationships.

***247. Theories of Rhetorical Criticism (4) I.**

Discussion/seminar—4 hours. Prerequisite: one course in rhetorical theory and/or criticism. Historical evolution of critical standards from the pre-Socratics to the twentieth century. Emphasis on contemporary questions of textuality, objectivity, intentionality, and justification.

248. Media Criticism (4) I. Ono

Seminar—4 hours. Prerequisite: a course in criticism. Examines broadcast, print, and visual media by means of rhetorical, psychological, semiological, sociological, and cultural studies and perspectives. Comparison of media and of critical theory scope in understanding media messages. Offered in alternate years.

249. Interpersonal Communication Theory (4) I. Bell

Lecture/seminar—4 hours. Prerequisite: course 134, 212, or consent of instructor. Major theories of interpersonal communication and related research.

***250. Special Topics in Rhetoric (4) III.**

Discussion/seminar—4 hours. Selected topics in rhetoric and communication. May be repeated for credit when a different topic is studied.

251. Special Topics in Interpersonal Communication (4) III. Berger

Seminar—4 hours. Prerequisite: graduate standing and consent of instructor. Selected topics in interpersonal communication. May be repeated for credit when topic changes.

***252. Special Topics in Mass Communication (4) III.**

Seminar—4 hours. Prerequisite: graduate standing and consent of instructor. Selected topics in mass communication theory and research. May be repeated for credit when topic changes.

253. Negotiation (4) II. Vohs

Seminar—4 hours. Prerequisite: graduate standing and consent of instructor. Theory and research on negotiating. Offered in alternate years.

***255. Medieval and Renaissance Rhetorical Theory (4)**

Seminar—4 hours. Prerequisite: course in ancient Greek and Roman rhetoric. Rhetorical theory from time of Saint Augustine (A.D. 430) to end of Renaissance (A.D. 1700). Three medieval rhetorical genres. Rise of universities. Effect of Renaissance humanism, printing, and science. Influence of major theorists such as Erasmus, Melancthon, Ramus, and Bacon.

***256. Early Modern Rhetorical Theory (4)**

Seminar—4 hours. Prerequisite: course in Classical or Renaissance rhetoric. Development of English and continental theories of rhetoric, 1700-1900. Emphasis upon the works of Priestley, Reid, Campbell, Blair, and Whately. Special attention to psychological, epistemological, and belletristic elements. Offered in alternate years.

***260. Communication Applications (2-4) I, II, III.**

The Staff (Chairperson in charge)

Discussion—1 hour; supervised field work—3-9 hours. Prerequisite: course 220. Field work in communication. Organization and implementation of a research project for a specific application of a communication program. May be repeated once for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Lecture—3 hours.

299. Individual Study (1-12) I, II, III. The Staff

(Chairperson in charge)

(S/U grading only.)

299R. Thesis Research (1-12) I, II, III. The Staff

(Chairperson in charge)

Independent study—3-36 hours. Prerequisite: graduate standing in Rhetoric and Communication. (S/U grading only.)

Professional Course**390. Teaching Communication Skills at the College Level (4) I.** The Staff (Chairperson in charge)

Lecture—2 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: graduate standing or consent of instructor. Problems and techniques of teaching basic communication skills courses at the college level. (S/U grading only.)

Russian

(College of Letters and Science)

James Gallant, Ph.D., Program Director

Program Office, 422 Sproul Hall (916-752-4171)

Committee in Charge

Robert O. Crummey, Ph.D. (History)

James Gallant, Ph.D. (Russian)

Harriet Murav, Ph.D. (Russian)

Daniel Rancour-Laferrriere, Ph.D. (Russian)

Faculty

Yuri Druzhnikov, Ph.D., Associate Professor

James Gallant, Ph.D., Lecturer

Lisa Little, M.A., Lecturer

Harriet Murav, Ph.D. Associate Professor

Daniel Rancour-Laferrriere, Ph.D., Professor

Emeriti Faculty

Valerie A. Tumins, Ph.D., Professor Emerita

The Major Program

The Russian major exposes students to a culture rich in art, language, and literature and presents an important skill needed to enter the fields of foreign affairs, world politics, and international trade, or to begin graduate work in literature, history, and international relations.

The Program. The department offers a choice of three emphases. The common basis for the first two is extensive training in the Russian language. The *Russian Literature* emphasis concentrates on the evaluation of Russian literary movements and cultural trends. The second area of study, the *Russian Language* emphasis, focuses on linguistics and practical language skills. The third area, the *Russian Area Studies* emphasis, provides an interdisciplinary program offering training in the Russian language and literature and in the historical development and contemporary social, political, and economic conditions of the former Soviet Union.

Internships, Study Abroad, and Career Alternatives. Students who have completed two years of Russian language study can participate in the Education Abroad Program in Moscow. Many of our students also participate in summer, semester, and year programs sponsored by CIEE and ACTR in St. Petersburg and Moscow. Russian majors may participate in internships where they can serve as translators and interpreters for schools and business firms throughout Northern California. Upon graduation, many Russian majors enter the business world or enter graduate programs in Slavic studies and international relations. The department encourages students to supplement their Russian studies with courses in related fields such as international relations, political science, computer science, or economics in order to maximize their career possibilities.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	0-38
Literature/Language emphasis	
Russian 1 through 6 (or the equivalent) ..	0-30
Russian 41, 42	8
Recommended, Linguistics 1.	
Area Studies emphasis	
Russian 1 through 6 or the equivalent	0-30
Russian 41 or 42 or the equivalent course in basic literary analysis	4
Depth Subject Matter	36-44
Russian Literature emphasis	
Russian 101A, 101B, 101C	12
Russian 102 or 103 or 105	4
Russian 121, 123	8
Russian 127 or 128	4
Additional upper division units chosen in consultation with adviser	8
Russian Language emphasis	
Russian 101A, 101B, 101C	12
Russian 102 or 105	4
Russian 103 or 104	4
Russian 160	4
Additional upper division units chosen in consultation with adviser	12
Russian Area Studies emphasis	
Russian 105	4
Russian 101A, 103, or 104	4
Russian 150	4
Three literature courses to be chosen from Russian 121, 123, 126, 128, 140, 141 ..	12
History 137B, 137C	8
Three courses, with no more than two in one area, to be chosen from the following two areas: (a) History 137A, 138, 102F; (b) Social sciences—Political Science 136, Economics 117, Geography 124	12
(To meet special interest course needs, a student should obtain written approval from an adviser.)	
Total Units for the Major	44-78

Major Adviser. J. Gallant.

Honors and Honors Program. The honors program comprises at least one quarter of study under course 194H, which will include a research paper. See also the University and College requirements.

Minor Program Requirements:

Two minor programs are available to students interested in obtaining a solid background in Russian language or literature. The Literature minor does not require a knowledge of the Russian language. Individual minor programs may be designed in consultation with the undergraduate adviser.

UNITS

Russian	20
Russian Language emphasis	20
Russian 6	4
Russian 101A, 101B, 101C	12
One course from Russian 102, 103, 104, 105, 160	4
Russian Literature emphasis	20
Russian 41 or 42	4
Russian 121, 123; and 140 or 141	12
One course from Russian 120, 126, 150, 154 ..	4
Russian Area Studies emphasis	20
Three courses to be chosen from Russian 121, 123, 126, 150, 154 (Russian 41 or 42 or the equivalent course in basic literary analysis required)	12
One course from History 137B, 137C	4
One course from Political Science 136, Economics 117, Geography 124	4

Teaching Credential Subject Representative. J. Gallant. See also under Teacher Education Program.

Graduate Study. The Department offers two programs of study (one with emphasis on language and culture, the other with emphasis on literature) leading to the M.A. degree. Detailed information may be obtained by writing to the Graduate Adviser. *Admission into the graduate program in Russian is closed for the 1994-95 academic year.*

Graduate Adviser. D. Rancour-Laferrriere.

Prerequisite credit. Credit normally will not be given for a course if that course is the prerequisite for a course already completed.

Courses in Russian (RUS)

Lower Division Courses

Course Placement. Students who have learned Russian at home must consult the department for placement instructions. Students with two years of Russian in high school normally continue in Russian 2; those with three years, Russian 3; those with four years, Russian 4.

1. Elementary Russian (5) I. The Staff

Discussion—5 hours; laboratory—1 hour. Introduction to Russian grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed Russian 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Russian (5) II. The Staff

Discussion—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of grammar and language skills developed in course 1.

3. Elementary Russian (5) III. The Staff

Discussion—5 hours; laboratory—1 hour. Prerequisite: course 2. Continuation of grammar and language skills developed in course 2.

4. Intermediate Russian (4) I. The Staff

Discussion—4 hours; laboratory—1 hour. Prerequisite: course 3. Grammar review and conversational practice.

5. Intermediate Russian (4) II. The Staff

Discussion—4 hours; laboratory—1 hour. Prerequisite: course 4. Grammar review. Introduction to literature. Conversational practice.

6. Intermediate Russian (4) III. The Staff

Discussion—4 hours; laboratory—1 hour. Prerequisite: course 5. Grammar review. Intermediate conversation and continued reading of literature.

***204. Descriptive Russian Grammar** (4) III. Gallant
Lecture—3 hours; reading projects—1 hour. Introduction to modern Russian phonology and morphology. Offered in alternate years.

***210A. Style and Syntax** (4) I. Druzhnikov
Discussion—3 hours; reading projects—1 hour. Examination of stylistic differences between spoken and written Russian.

***210B. Style and Syntax** (4) II. Druzhnikov
Discussion—3 hours; reading projects—1 hour. Prerequisite: course 210A or consent of instructor. Examination of stylistic differences between spoken and written Russian.

***210C. Russian Style and Syntax** (4) III. Druzhnikov
Discussion—3 hours; term paper. Prerequisite: course 210B or consent of instructor. Students present formal papers and talks on political, economical, social, and cultural topics, lead and participate in discussions. Conducted in Russian.

***220. Old Russian Literature** (4) II. The Staff
Seminar—3 hours. Advanced study of intellectual movements and literary styles of works such as *The Song of Igor's Campaign*, *Zadonshchina*, Epifany's *Lives*, Ivan IV's cycle of epistles. May be repeated for credit when different topics are studied. Offered in alternate years.

***221. Eighteenth-Century Russian Literature** (4) II. The Staff
Seminar—3 hours. Advanced study of literary movements and styles in prose or poetry. The works of writers such as Kantemir, Lomonosov, Sumarokov, Radishchev and Karamzin will be analyzed. May be repeated for credit when different topics are studied. Offered in alternate years.

***222. Nineteenth-Century Russian Literature** (4) I. Rancour-Laferriere, Murav
Seminar—3 hours. Advanced study of the works of one or several writers or movements of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered in alternate years.

***223. Early Twentieth-Century Russian Literature** (4) I. Rancour-Laferriere
Seminar—3 hours. Advanced study of one or more of the modernist movements in Russian literature, including Symbolism, Acmeism, and Futurism. May be repeated for credit when different topics studied. Offered in alternate years.

***224. Soviet Russian Literature** (4) III. Rancour-Laferriere, Druzhnikov
Seminar—3 hours. Analysis of selected works of Russian prose and poetry with particular emphasis on works of extraordinary literary merit or of unusual importance in the development of genres, schools, styles, techniques, and various formal elements. May be repeated for credit when different topics are studied. Offered in alternate years.

230. Pushkin Studies (4) I. Druzhnikov
Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: graduate standing or consent of instructor. The life and works of Pushkin; the history of Pushkin studies up to and including present-day controversies about Pushkin. Evaluations of Pushkin by both Russian and Western scholars. Images of Pushkin and the official myths that surround him. Conducted in Russian; readings in Russian and English.

231. Humor and Satire (4) III. Druzhnikov
Lecture/discussion—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Origin and value of humor and satire in 18th-20th century Russian literature. Humor and satire as psychological phenomena and in literacy theory. Classical writers as satirists. Link between satire and democratization of Russia. Conducted in Russian; readings in Russian and English. Offered in alternate years.

***205. Languages of Culture: Formalism, Semiotics, and Dialogue** (4) I. Murav
Lecture/discussion—3 hours; term paper. Prerequisite: consent of instructor. Critical paradigms of formalism, semiotics, and "post-Structural" methods of M. Bakhtin, viewed in their historical and philosophical

contexts. Extensions and critical evaluations of these paradigms in literary criticism, history, anthropology.

***298. Group Study** (1-5) I, II, III. The Staff (Director in charge)

***299. Research** (1-12) I, II, III. The Staff (Director in charge)
(S/U grading only.)

Professional Course

300. The Teaching of Russian (2) I. The Staff
Discussion—2 hours. Prerequisite: graduate standing or consent of instructor. Workshop in language teaching methods. Students audit classes in progress and teach under faculty supervision. Required of new and prospective teaching assistants. (S/U grading only.)

Science and Society

(College of Agricultural and Environmental Science)

Howard G. Schutz, Ph.D., Program Director
Program Office, 228 Mrak Hall (916-752-8669)

Committee in Charge

Patricia J. Berger, Ph.D., Associate Professor
(*Animal Science*)

Jeffrey Granett, Ph.D., Professor (*Entomology*)

Gloria E. Helfand, Ph.D., Assistant Professor
(*Agricultural Economics*)

Janet L. Hethorn, Ph.D., Assistant Professor
(*Environmental Design*)

Susan B. Kaiser, Ph.D., Professor (*Textiles and Clothing*)

David S. Reid, Ph.D., Professor (*Food Science and Technology*)

Roger J. Romani, Ph.D., Professor Emeritus
(*Pomology*)

Howard G. Schutz, Ph.D., Professor Emeritus (*Food Science and Technology*)

Ellen Sutter, Ph.D. Associate Professor (*Pomology*)

The Program. Science and Society is an interdepartmental teaching program administered by the College of Agricultural and Environmental Sciences and designed to offer students throughout the campus the opportunity to discover the connections that link the social, biological, and physical sciences with societal issues and cultural discourses. Coursework examines discovery processes in relation to societal values, public policy and ethics, including issues associated with cultural diversity. Whenever possible, outside the classroom opportunities are included as part of the learning experience.

The Science and Society teaching program serves students of all majors and interests in two ways. First, it allows lower division students who have not yet declared a major a meaningful context for exploring diverse subject matters. The curriculum emphasizes the pathways to discovery, the relations among disciplines, and the relevance of the sciences for enhancing the quality of everyday life. Second, the program provides coordination among General Education courses that highlight social-political controversies revolving around such topics as the environment, sustainable agriculture, and human health and development. Courses from diverse departments and disciplines are organized into clusters to enable students to see their interrelations and to understand key science-society interactions.

Related courses. See Agricultural Economics 148, Agricultural Systems and Environment 1-1G, Animal Science/International Agricultural Development 102, Applied Behavioral Sciences 18, Avian Sciences 13, Fiber and Polymer Science 110, Plant Pathology 140, Plant Science 1, 10, 104, Wildlife and Fisheries Biology 10.

Courses in Science and Society (SAS)

Lower Division Courses

1. Pathways to Discovery: Science and Society

(3) I, II, III. The Staff
Lecture/discussion—3 hours. Introduction to diverse discovery processes pertaining to Science and Society. Course varies with topic offered. May be repeated for credit.

2. Feeding the Planet: Influence on the Global Food Supply

(3) II. Reid
Lecture—2 hours; lecture/discussion—1 hour. Scientific principles and dynamic interactions involved in food production, food processing, nutrition, shelf life and marketing from differing viewpoints. Physical, biological and social science issues influencing the availability and safety of the food supply worldwide.

90X. Lower Division Seminar (1-4) I, II, III. The Staff
Seminar—1-4 hours. Prerequisite: lower division standing and consent of instructor. Examination of a special topic in Science and Society through shared readings, discussions, written assignments, or special activities such as fieldwork, laboratory work, etc. Limited enrollment. May be repeated for credit.

98. Directed Group Study (1-5) I, II, III. The Staff
Prerequisite: Consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Special Topics: Science and Society

(3) I, II, III. The Staff
Lecture/discussion—3 hours. Prerequisite: Varies with topic; consent of instructor. Group study of a special topic emphasizing interactive systems approaches in Science and Society. Course varies with topic offered. May be repeated for credit.

190X. Upper Division Seminar (1-4) I, II, III. The Staff
Seminar—1-4 hours. Prerequisite: upper division standing and consent of instructor. In-depth examination at an upper division level of a special topic in Science and Society. Emphasis upon student participation in learning. May be repeated for credit. Limited enrollment.

198. Directed Group Study (1-5) I, II, III. The Staff
Prerequisite: Consent of instructor. (P/NP grading only.)

Social Theory and Comparative History

William W. Hagen, Ph.D., Program Director
Program Office: 2231 Social Sciences and Humanities Building, 752-8707

Graduate Study. The program comprises coursework and research leading to the Ph.D. with a designated emphasis in Social Theory and Comparative History. The program provides theoretical training and interdisciplinary perspective to Ph.D. candidates in the five participating departments (Anthropology, Economics, History, Political Science, Sociology). Students must fulfill all Ph.D. requirements of their home department. The additional requirements leading to the designated emphasis include: 1) four graduate courses (Social Theory and Comparative History 250 or History 204, Sociology 242A, and two courses sponsored by the Social Theory and Comparative History program, one of which must be offered by a department other than the student's home department); 2) presentation of a Social Theory and Comparative History field as one area of specialization in the departmental Ph.D. qualifying examination; 3) an oral examination, following passage of the Ph.D. qualifying examination, based on the student's dissertation prospectus; 4) completion of the dissertation to the satisfaction of the student's thesis committee, one of whose members

will be a representative of the Social Theory and Comparative History program.

Graduate Adviser. Consult the Program Office for advising and detailed information on application and requirements.

Courses in Social Theory and Comparative History (STH)

Graduate Courses

250. Research in Social Theory and Comparative History (4) I. The Staff

Seminar—3 hours; term paper. Prerequisite: admission to Social Theory and Comparative History Designated Emphasis. Theoretically informed research in comparative history. Students read exemplary works and learn to frame their own research projects. Presentations include Center for Comparative Research faculty and visitors discussing current research.

290. Advanced Topics in Social Theory and Comparative History (4) I, II, III. The Staff

Seminar—3 hours; term paper. Prerequisite: consent of instructor and History 204 or Sociology 242A. Interdisciplinary study of particular substantive problems in social theory and comparative history. Topics vary.

295. Advanced Group Research in Social Theory and Comparative History (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: consent of instructor. Participation in research workshops sponsored by the Center for Comparative Research in History, Society, and Culture. May be repeated for credit. (S/U grading only.)

Sociology

(College of Letters and Science)

Fred Block, Ph.D., Chairperson of the Department
Department Office, 113 Young Hall (916-752-0784)
Advising Office, 109 Young Hall (916-752-0786)

Faculty

Nicole W. Biggart, Ph.D., Professor
(Sociology, Management)
Fred Block, Ph.D., Professor
Lawrence E. Cohen, Ph.D., Professor
James C. Cramer, Ph.D., Associate Professor
Diane H. Feinlee, Ph.D., Associate Professor
Jack A. Goldstone, Ph.D., Professor
Bruce M. Hackett, Ph.D., Associate Professor
John R. Hall, Ph.D., Professor
Frank Hirtz, Ph.D., Assistant Professor
Mary Jackman, Ph.D., Professor
Carole E. Jaffe, Ph.D., Professor (Sociology,
Women's Studies)
Carl C. Jorgensen, Ph.D., Associate Professor
John F. Lofland, Ph.D., Professor
Lyn H. Lofland, Ph.D., Professor
Dario Melossi, Ph.D., Associate Professor
Donald A. Palmer, Ph.D., (Management)
Belinda Robnett, Ph.D., Assistant Professor
(Sociology, Women's Studies)
Julius A. Roth, Ph.D., Professor
John F. Scott, Ph.D., Professor
Judith Stacey, Ph.D., Professor (Sociology, Women's
Studies)
John H. Stanfield, Ph.D., (African American Studies)
John T. Walton, Ph.D., Professor (Anthropology,
Sociology)
Diane L. Wolf, Ph.D., Associate Professor

Emeriti Faculty

Edwin M. Lemert, Ph.D., Professor Emeritus
Leon H. Mayhew, Ph.D., Professor Emeritus

The Major Programs

Sociology is the study of human society in all its manifestations. Its aim is to discover the process and structure of human interaction, to identify the main forces that sustain or weaken social groups, and

determine the conditions that transform social life. Sociology, like any science, is a disciplined, intellectual quest for knowledge about the fundamental nature of things.

The Program. The Department of Sociology offers two major programs, Sociology and Sociology-Organizational Studies.

Students selecting the Sociology major may choose from four options offered within this major. The *General* Sociology emphasis allows students to obtain a broad understanding of the concepts, methods, and theories of sociology. This option is designed for students desiring a solid liberal arts education as well as those interested in graduate work in the social sciences. Students with a special interest in the areas of *Law and Society* or *Social Services* may choose a more specialized program of courses and practical experience within the sociology major. These options are designed to prepare students for careers in such areas as law, corrections, social work or counseling. The *Comparative Studies and World Development* emphasis provides a sociological perspective on social and economic changes throughout the world, with a stress on relationships between "developed" and "underdeveloped" societies. It can prepare students for graduate training leading to careers in international fields. Students are encouraged to consider the Education Abroad Program for their junior year, especially one in a developing country.

The Sociology-Organizational Studies major is designed to develop a broad understanding of the political, social, and economic organizations that comprise modern society. This major emphasizes a sociological perspective, but incorporates a multidisciplinary field of study. The major introduces students to a range of theories and methods that social scientists use in the analysis of organizations. Majors in Sociology-Organizational Studies will be prepared for a variety of career options, particularly in the field of management. The major has been specifically designed to meet entry requirements for programs of professional training leading to a Masters degree in public or private management, and may also lead to further study in any of the disciplinary areas incorporated in the major.

The Department of Sociology sponsors the interdisciplinary minor in War-Peace Studies. Composed of courses from several departments, it is not a minor in Sociology and is entered in transcripts as "War-Peace Studies." For requirements and other details see War-Peace Studies.

SOCIOLOGY MAJOR

A.B. Degree Requirements:

General emphasis:

UNITS

Preparatory Subject Matter24-25

Sociology 1, 2, or 3; 46A and 46B (or the equivalents†).....12-13
Select units from Anthropology 2, 4.....4
Select units from History 3, 4A, 4B, 4C, 8, 9A, 9B, 10, 15, 17A, 17B.....4
Select units from Philosophy 1, 5, 14, Political Science 4.....4

Depth Subject Matter44

Sociology 126, 140, 165A, 165B, 170, 180A...24
Select two courses each from **two** of the following seven clusters and one additional course from a third cluster.....20
Family, Gender, and Social Interaction
Sociology 122, 127, 131, 132, 143B
Law and Social Services
Sociology 120, 150, 152, 154, 155, 158, 185

Social Conflict and Change
Sociology 123, 141, 142, 143A, 145A, 147, 148, 156, 157, 180B, 181, 182

Race and Ethnicity
Chicano Studies 110, Sociology 128, 129, 130, 134, 172

Power and Politics
Sociology 118, 119, 133, 139, 144, 159, 183
Knowledge and Communication
Sociology 124, 125, 146, 173, 175, 176
Methodology
Sociology 103, 106 (or the equivalents†); 192, 194HA, 194HB

Total Units for the Major68-69
(General emphasis)

Law and Society emphasis:

UNITS

Preparatory Subject Matter24-27

Sociology 1, 3; 46A and 46B (or the equivalents†).....17
Select units from Anthropology 1, 2, Economics 1A, 1B, History 3, 4B, 4C, 17A, 17B, Philosophy 1, 12, 21, 22, 23, Political Science 1, 2, 3, 4, Psychology 1, 15.....7-10

Depth Subject Matter40

Sociology 155.....4
Select units from Sociology 120, 150, 152...8
Select units from Sociology 118, 122, 123, 130, 131, 139, 140, 141, 143A or 143B, 156, 165B, 180A or 180B, 185.....12
At least 16 additional units in upper division sociology courses to achieve a minimum of 40 units.....16

Total Units for the Major65-67

(Law and Society option)

Social Services emphasis:

UNITS

Preparatory Subject Matter28

Sociology 2, 3; 46A and 46B (or the equivalents†).....16
Psychology 1.....4
Select units from African American Studies 10, 15; Asian American Studies 1, 2; Chicano Studies 10, 20; Native American Studies 10, 70.....8

Depth Subject Matter44

Sociology 131, 140, 185.....12
Select units from upper division human psychology.....4
Select seven courses distributed as specified.....28

Social Issues

Sociology 119, 120, 122, 124, 139, 143A, 144, 146, 150, 152, 154, 155, 170.....8

Social Interaction

Sociology 126, 127, 128, 143B, 148, 157.....4

Race and Ethnicity

African American Studies 100; Applied Behavioral Sciences 176; Asian American Studies 110, 111, 150; Chicano Studies 110; Native American Studies 112, 124; Sociology 129, 130, 134.....4

Gender

Sociology 132, 133, 145B, 172.....4

Organizational Behavior

Sociology 158, 180A, 180B, 181, 182, 183.....4

Methodology

Sociology 103, 106 (or the equivalents†), 192, 194HA, 194HB.....4

Total Units for the Major72

(Social Services option)

Comparative Studies and World Development emphasis:

UNITS

Preparatory Subject Matter30-57

Sociology 1; 46A and 46B (or the equivalents†).....13
Economics 1A, 1B.....10

*Course not offered this academic year.

Anthropology 2.....	4
At least 4 units from Geography 2-2G, History 10, Political Science 2.....	4
Course work in language instruction in modern foreign language equivalent to 26 units at UCD.....	26

Depth Subject Matter48

Sociology 141, 145A, 165A, 170.....	16
Economics 115A, Anthropology 126.....	8
At least twelve units from Sociology 118, 130, 131, 143A, 144, 145B, 156.....	12
Regional focus, three courses from one of the following groups.....	12

(a) *Africa/Middle East*: Anthropology 140A, 140B, 142, Economics 175, Geography 125A, 125B, History 115A, 115B, 115C, 116, Political Science 134, 146

(b) *Latin America/Pacific*: Anthropology 144, 147, Geography 122A, 122B, History 161A, 161B, 162, 165, Spanish 135, 136

(c) *Asia*: Anthropology 149, Economics 171, 172, 173, Geography 126, 127, History 193, 194A, 194B, 194C, Political Science 138, 148A, 148B, Religious Studies 168, 172, Sociology 147

Total Units for the Major79-105

(Comparative Studies and World Development)

SOCIOLOGY—ORGANIZATIONAL STUDIES MAJOR**A.B. Degree Requirements:**

UNITS

Preparatory Subject Matter26

Sociology 1, 46A, 46B (or Statistics 13).....	13
Economics 1A, 1B.....	10
Mathematics 16A.....	3
Recommended: Computer Science Engineering 10, Mathematics 16B, 16C	

Depth Subject Matter44-45

Sociology 180A, 180B.....	8
Sociology 103 (or the equivalent†).....	4
Sociology 106 (or the equivalent†).....	4
Economics 100 or Agricultural Economics 100A.....	4-5
Units from Applied Behavioral Sciences 162, 163, 164, Agricultural Economics 112....	4
Units from History 151D, 174A, 174B, 174C, 185A, 185B, 187A, 187B, 194D, Anthropology 122.....	4
Units from Political Science 107, 120, 123, 175, 176, 180, 181, 183, 187, 188.....	4
Units from Psychology 183, Rhetoric and Communication 130, 134, 136, 152, American Studies 125.....	4
Units from Sociology 118, 139, 141, 156, 159, 181, 182, 183, 192.....	8
Units from Chicano/a Studies 132, Sociology 130, 132, 133, 140, 172.....	4

Total Units for the Major70-71

†Consult a major adviser to determine equivalents.

Major Advisers. Consult the Departmental Advising Office, 109 Young Hall.

Honors Program. An Honors Program is available to Sociology and Sociology—Organizational Studies majors who have demonstrated excellence in their field of study. To be eligible for the program, students must have a grade-point average of 3.5 in the major and the recommendation of a faculty sponsor familiar with their work. In addition to meeting the standard major requirements, the honors student writes an honors thesis and participates in a two-quarter honors seminar (course 194HA-194HB). Successful completion of the Honors Program, when combined with College GPA requirements, enables the student to graduate with Highest Honors or with High Honors.

Minor Program Requirements:

Students in other disciplines may elect to minor in Sociology by choosing a sociological subject emphasis listed below. On transcripts, the minor will appear as a minor in Sociology.

UNITS

Sociology—General20

Select units from Sociology 126, 140, 165A, 170, 180A.....	8
One course from each of three clusters (see cluster lists under Sociology Major—General Emphasis).....	12

Sociology—Organizational Studies20

Sociology 180A and 180B.....	8
Select units from Agricultural Economics 112, American Studies 125, Applied Behavioral Sciences 162, 163, 164, Economics 100, Political Science 180, 181, 183, 187, 188, Psychology 183, Rhetoric and Communication 134, 136.....	8
Select units from Anthropology 122, History 174A, 179, 187A, 187B, 194D, Sociology 118, 139, 141, 156, 159, 175, 181, 183....	4

Sociology—Social Service20

Sociology 185, plus 4 units selected from Sociology 131, 132, 133, 145B.....	8
Four units from Sociology 129, 130, 133, 134, 140, 172.....	4
Four units from Social Issues cluster and four units from Social Interaction cluster (See cluster lists under Sociology Major—Social Services emphasis).....	8

Sociology—Law and Society20

Sociology 155, plus 4 units selected from Sociology 120, 150, 152.....	8
Four units from Sociology 129, 130, 131, 132, 133, 134, 172.....	4
Four units from Sociology 118, 139, 140, 141, 145A or 145B, 180A or 180B, 185.....	4
Four units from Sociology 122, 124, 126, 128, 143A or 143B, 156, 157, 165A or 165B....	4

Minor Advisers. Consult the departmental Advising Office, 109 Young Hall.

Graduate Study. The Department offers programs of study and research leading to the M.A. and Ph.D. degrees in sociology. Further information and applications regarding graduate study may be obtained at the department office.

Graduate students in Sociology have the opportunity to pursue designated emphases in Critical Theory, Women's Studies, Social Theory and Comparative History, or Native American Studies. See these headings for further details on these interdisciplinary programs.

Graduate Advisers. Consult the Graduate Administrative Assistant, 111 Young Hall.

Courses in Sociology (SOC)**Lower Division Courses**

1. Introduction to Sociology (5) I, III. The Staff
Lecture—4 hours; discussion—1 hour. Principles and basic concepts of sociology. The study of groups, culture, collective behavior, classes and caste, community and ecology, role, status, and personality.

2. Self and Society (4) I. The Staff; II. L. Lofland
Lecture—3 hours; discussion—1 hour. Principles and basic concepts of sociological social psychology. Includes the study of the character of the self, identity, roles, socialization, identity change, emotion and social interaction. General Education credit: Contemporary Societies.

3. Social Problems (4) I. Jorgensen; II. The Staff
Lecture—3 hours; discussion—1 hour. General sociological consideration of contemporary social problems in relation to sociocultural change and programs for improvement. General Education credit: Contemporary Societies.

4. Immigration and Opportunity (4) III. Cramer
Lecture—3 hours; term paper/discussion—1 hour. Social and demographic analysis of immigration:

motives and experiences of immigrants; immigration and social mobility; immigration, assimilation, and social change; multicultural societies. Detailed study of immigration into the U.S., with comparative studies of Europe, Australia, and other host countries. General Education credit: Contemporary Societies.

25. Sociology of Popular Culture (4) I, III. The Staff
Lecture—3 hours; discussion—1 hour. Social mechanisms that shape modern popular culture. High, folk, and mass culture: historical emergence of popular culture. Mass media, commercialization, ideology and cultural styles. Theories and methods for analyzing cultural expressions in pop music, street art, film, television, and advertising. General Education credit: Contemporary Societies.

46A. Introduction to Social Research (4) I. The Staff; III. J. Lofland
Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Examination of the methodological problems of social research. Selection and definition of problems of investigation, data-gathering techniques, and sampling.

46B. Introduction to Social Research (4) II.

Felmler; III. The Staff
Lecture—3 hours; discussion—1 hour or term paper or research project. Data-analysis techniques, measurement, scaling, multivariate analysis, and quantitative measures of association.

90X. Lower Division Seminar (1-2) I, II, III. The Staff (Chairperson in charge)

Seminar—1-2 hours. Prerequisite: lower division standing and consent of instructor. Examination of a special topic in Sociology through shared readings, discussions, written assignments, or special activities such as fieldwork, laboratory work, etc. May not be repeated for credit. Limited enrollment.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Primarily intended for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III.

The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

103. Evaluation Research Methods (4) I, III. The Staff

Lecture—3 hours; discussion—1 hour or field research (decided by instructor each time course offered). Prerequisite: course 46A and 46B, or Statistics 13 or the equivalent. Surveys applications of research methods to the evaluation of social programs, primarily emphasizing methodological issues, e.g., research design and data collection; uses of evaluation research are also discussed and placed in theoretical context. Participation in an evaluation project.

106. Intermediate Social Statistics (4) I. Cramer; III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 46B or Statistics 13 or the equivalent. Intermediate level course in statistical analysis of social data, emphasizing the logic and use of statistical measures, procedures, and mathematical models especially relevant to sociological analysis.

***107. Seminar in Sociological Analysis (4) I.** Jorgensen

Seminar—3 hours; to be arranged—1 hour. Research and analysis using basic concepts of sociology, social organization, culture, socialization, stratification in application to specific problems. May be repeated for credit with consent of instructor. Limited enrollment.

118. Political Sociology (4) I. Jackman; II. Goldstone

Lecture—3 hours; discussion—1 hour or term paper or research project. Relation of social cleavages and social cohesion to the functioning of political institutions; the social bases of local and national power structures; social sources of political movement, analysis of concepts of alienation, revolution, ideology, ruling class, and elite.

***119. Peace Institutions (4)** II. J. Lofland

Lecture—3 hours; discussion—1 hour or term paper or project. Survey and analysis of private and public groups and organizations working for world peace by means other than preparing for war or supporting such preparations. Particular focus on peace institutions in the political, economic, scientific, religious, and educational realms.

120. Deviation and Society (4) I. The Staff; II. Melossi

Lecture—3 hours; discussion—1 hour or term paper or research project. Theory and studies of deviation in relation to societal reaction, group processes and social roles. Stigma and incapacity; cosmetic defect. Deviation theory applied to selected crimes, prostitution, drugs, alcohol use, and mental disorders. Creativity and society.

122. Sociology of Adolescence (4) II. The Staff

Lecture—3 hours; discussion—1 hour or term paper or research project. Chronological age and social status; analysis of social processes bearing upon the socialization of children and adolescents. The emergence of "youth cultures." Generational succession as a cultural problem.

123. American Society (4) I. The Staff

Lecture—3 hours; discussion—1 hour or term paper or research project. The demographic and social structure of American society and population, with emphasis on ethnic and class groups as bases for political and economic interest. Attention to selected current social controversies.

***124. Sociology of Education (4)** II. Scott

Lecture—3 hours; term paper or discussion—1 hour (instructor's option). Education and the social structure. Class size, curriculum, and economies of scale. Relations between families and schools in socialization; familial ascription and educational achievement. Education and industrialization. Organizational and occupational structure of schools. Discussion of selected controversies.

126. Social Interaction (4) II. The Staff; III. L. Lofland

Lecture—3 hours; discussion—1 hour or term paper or research project. Prerequisite: course 2. Everyday interaction in natural settings; ethnographic approaches to the understanding of social meanings, situations, personal identity and human relationships. Particular attention to the work of Erving Goffman and to principles of field observation and qualitative analysis.

***127. Sociology of Death (4)** III. L. Lofland

Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Prerequisite: course 1 or the equivalent. Overview of attitudes toward, structural effects of, and methods of coping with death and death-related behaviors. Particular attention to social psychological aspects of death and dying, to death occupations, and to death rituals in various cultures.

128. Interracial Interpersonal Dynamics (4) III. Jorgensen

Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Prerequisite: one course from courses 1, 2, 3, Afro-American Studies 10, Asian American Studies 1, 2, Chicano Studies 10, Native American Studies 1, 20. Analysis of the influences of cultural differences and racial stratification on interpersonal interaction in instrumental settings (e.g., work, education, political action) and intimate settings (e.g., friendship, love, marriage, family). Minority/majority relationships.

129. Sociology of Black Experience in America (4) II. Jorgensen

Lecture—3 hours; discussion, research, or term paper (instructor's option). Survey of historical and contemporary theoretical sociological perspectives on the Black experience in United States. Emphasis on comparisons of Black sociological perspectives and mainstream perspectives of specific sociologists.

130. Race Relations (4) I, III. Jorgensen

Lecture—3 hours; discussion—1 hour or term paper or research project. Functions of the social definitions of race and racial groups. Analysis of racial conflict, oppression, and other forms of ethnic stratification.

Models of ethnic interaction and social change. Emphasis on racial relationships within the U.S.

131. The Family (4) I. The Staff; II. Stacey; III. Wolf
Lecture—3 hours; discussion—1 hour. Contemporary family life in historical and cross-cultural perspective. How different family forms arose, their significance today and prospects for further family change. Attention to power relations within and beyond the family and to the social implications of family transformation.

132. The Sociology of Gender (4) I. The Staff; II.

Robnett; III. Stacey
Lecture—3 hours; discussion—1 hour. Analysis of biological, psychological, cultural and structural conditions underlying the status and roles of men and women in contemporary society, drawing on a historical and comparative perspective. Offered in alternate years.

***133. Sexual Stratification and Politics (4)** II. Joffe
Lecture—3 hours; discussion—1 hour. Prerequisite: course 132 or the equivalent or consent of instructor. Analysis of origins, dynamics, and social implications of sexual stratification. Examination of classical and contemporary theorists such as Engels, Freud, J.S. Mill, de Beauvoir, Juliet Mitchell, D. Dinnerstein. Attention to selected issues in social movements for and against sexual equality.

***134. Sociology of Racial Ethnic Families (4)** I. Robnett

Lecture—3 hours; discussion—1 hour or term paper. Asian American, Black, Chicano, and Native American family life in comparative historical perspective. Family structure and gender roles are considered in relation to socio-historical dynamics. Offered in alternate years.

135. Social Relationships (4) II. Felmlee

Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: course 1, 2 or 3, and upper division standing. Social and cultural factors influencing friendships and intimate relationships. Topics include relationship development, relationship maintenance, and relationship loss. Offered in alternate years.

138. Economic Sociology (4) II. Block

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A or 1B and upper division standing in the social sciences. Overview of the rapidly growing field of economic sociology. Focus on variations in the ways that markets are organized. The relationship between individual and collective rationality will also be emphasized. Offered in alternate years.

139. Corporations and Society (4) I. Goldstone; III. Block

Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: course 1 or 2 or 3, and upper division standing. The study of the history and power of the modern corporation; corporate organization; politics, the state, and the corporation; labor unions and the labor process; competition, regulation and international markets; the multinational and conglomerate corporation; and mass markets and consumerism.

140. Social Stratification (4) I. Jackman; II. The Staff; III. Goldstone

Lecture—3 hours; discussion—1 hour or term paper or research project (instructor's option). Systems of social ranking, theories of stratification; power, prestige, culture, and styles of life of various social classes; social mobility and its consequences for social structure.

141. Industrialization and Social Change (4) II. The Staff

Lecture—3 hours; discussion—1 hour or term paper or research project. Selected technological and social factors. Preconditions of economic development and industrialization. Social, political, and cultural issues at various levels of economic development. Major historical differences and major current trends. Emphasis either on highly industrialized countries or on less developed countries.

***142. Sociology of Transportation (4)** III. Scott

Lecture—3 hours; discussion—1 hour or term paper or research project. Sociological factors in transportation. Consequences of transport mode development on social organization, sociological influences in

transport mode choice. Transportation issues in public policy.

***143A. Urban Society (4)** I. L. Lofland

Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Prerequisite: course 1 or the equivalent. Theories of city origins. Analysis of the historic process of urbanization and of varying city types. Comparison of American and European experience of metropolitanization, counterurbanization, and neighborhood change. Consideration of competing theories of urban growth and change and competing visions of the urban future. Offered in alternate years.

***143B. Sociology of City Life (4)** I. L. Lofland

Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Prerequisite: course 1 or the equivalent; course 143A recommended. Critical dissection of the "loss of community" issue. Analysis of the organization of primary ties in the city, of the culture of urban public life and of the learning of city skills. Offered in alternate years.

***144. Agriculture and Society (4)** Walton, Wolf

Lecture—3 hours; discussion—1 hour or term paper or research project. Prerequisite: advanced standing in the social sciences or one year of course work in agricultural and environmental sciences. Development of agriculture as a major enterprise in modern society with the concomitant reduction in the labor force and family farms. Analysis of issues including mechanization, migrant labor, corporate farming, and public resource policy. Offered in alternate years.

145A. Sociology of Third World Development (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; upper division standing. Introduction to theories and contemporary issues in the sociology of development. Topics such as urbanization, rural/agrarian change, class, status groups, international division of labor, sectoral shifts, international capital, informal economy, gender, and political processes are analyzed within a comparative-historical framework.

145B. Gender and Rural Development in the Third World (4) II. Wolf

Seminar—4 hours. Prerequisite: course 1; upper division standing. Political-economic analysis of women and work during the process of socioeconomic change in the world with particular attention to the family/household context. Offered in alternate years.

146. Sociology of Religion (4) II. Hall

Lecture—3 hours; discussion—1 hour or term paper or research project. Relationship between social structures and religions. The social setting of the major world religions. Religious innovators and institutionalization (churches, sects, cults). Secularization in the modern world and the rise of secular ideologies. Offered in alternate years.

***147. Sociological Perspectives on East Asia (4)** I. The Staff

Lecture—3 hours; discussion—1 hour or term paper or research project. Sociological theories and concepts applied toward understanding East Asian society. Emphasis on the political structure, stratification, and economy in China and Japan. Analysis of historical and contemporary similarities and differences. Offered in alternate years.

***148. Collective Behavior (4)** The Staff

Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Prerequisite: course 1 or the equivalent. Study of behavior of human crowds and masses in extraordinary circumstances, including crowd panics, mass scares, collective protests, riots, revolutionary situations, ecstatic and revivalist gatherings, crazes, fads, and fashions.

***149. Religion and American Society (4)** III. Hall

Lecture—3 hours; class project. Historical, contemporary survey of religious traditions and organizations and their relation to U.S. social and cultural patterns. Civil religion, religious pluralism, minority and deviant communities, religious migration, U.S. religion as a social institution, and religion, politics, and social stratification. Offered in alternate years.

150. Criminology (4) I, III. Cohen

Lecture—3 hours; discussion—1 hour or term paper or research project. Sociological analysis of criminal behavior in relation to social structure and the criminalization process.

152. Juvenile Delinquency (4) I, II. Cohen; III. The Staff

Lecture—3 hours; discussion—1 hour or term paper or research project. Study of juvenile delinquency in relation to the family, peer groups, community, and institutional structures. Consideration of processing of the delinquent by formal agencies of control.

154. Sociology of Health Care (4) I. The Staff

Lecture—3 hours; discussion—1 hour or term paper or research project. Overview of sociological research in medicine and health care, with emphasis on the organizational, institutional, and social psychological aspects.

155. Sociology of Law (4) I. The Staff; III. Melossi

Lecture—3 hours; discussion—1 hour or term paper or research project. Law considered as social control; relation of legal institutions to society as affecting judicial decision making and administration of justice. Lawyers as an occupational group. Legal reform.

156. Social Movements (4) II. J. Lofland

Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Analysis of several aspects of social movements: mobilization, forms of organization, ideology, recruitment, leadership, strategies and tactics, development, effects. Frequent use of sound and film materials.

***157. Social Conflict (4) III.** J. Lofland

Lecture—3 hours; discussion—1 hour or term paper or project. Analysis of the causes, dynamics, and regulation of social conflict within and between various kinds of social groupings with particular reference to nonviolent methods of waging and regulating conflict.

***158. Consumer-Vendor Relationships (4) III.** Roth

Lecture—3 hours; discussion—1 hour. Examine the relationship between consumers and the vendors of goods and services using case materials, student projects, and relevant literature in sociology and related fields. Emphasis will be on organizational structure and bargaining power.

***159. Sociology of Occupations (4) II.** Roth

Lecture—3 hours; discussion—1 hour or term paper or research project. Natural history of occupations; the institutional matrix of occupations; colleague and client relationships; occupational social controls; career lines, and occupational-related self-definitions; occupational politics.

165A. Sociological Theory (4) II. Melossi

Lecture—3 hours; discussion—1 hour or term paper or research project. Historical introduction to sociological theory with special reference to its European origins. The development of modern sociological theory in Europe by Durkheim, Weber, Simmel, Pareto, Mosca, and others.

165B. Sociological Theory (4) III. Hall

Lecture—3 hours; discussion—1 hour or term paper or research project. Contemporary sociological theory with special reference to the history of American sociology and the emergence of contemporary schools of thought in the United States. Schools discussed will include functionalism, symbolic interactionism, exchange theory, and ecology.

170. Population (4) II. Cramer

Lecture—3 hours; discussion—1 hour or term paper or research project. Introduction to the study of human population, including theories and statistical measures; social causes and consequences of population trends; changes in population structure; geographical distribution, migration, socio-psychological factors affecting fertility.

172. Ideology of Class, Race and Gender (4) II. Jackman

Lecture—4 hours. Examination of popular belief systems that accompany relations between social classes, whites and blacks, and men and women in the United States. How do dominant groups attempt to justify each relationship, and is there ideological conflict or consensus between groups.

***173. Sociology Through Literature (4) Walton**

Lecture—3 hours; discussion—1 hour or term paper or research project. Introduction to analysis of literature as sociological data. Reading of numerous works on American and other societies by authors such as Steinbeck, Lewis, Dreiser, Schulberg, Orwell, etc. Offered in alternate years.

175. Mass Communication (4) III. Lofland

Lecture—3 hours; term paper. Prerequisite: course 1 or 2. Examines the relationship between the media and social structures. History of media-state relations. Media as reflector and shaper of values. Emphasis on current European and Marxist and pluralist theories rather than on content analysis. Offered in alternate years.

***176. Sociology of Knowledge (4) I.** The Staff

Lecture—3 hours. Critical analysis of the social foundations of knowledge in society. The history, problems and dilemmas in classical sociology of knowledge. Contemporary applications. Natural and social sciences as social systems. Sociology of personal knowledge in everyday life.

180A. Complex Organizations (4) I. Biggart; II. The Staff

Lecture—3 hours; discussion—1 hour or term paper or research project. Prerequisite: course 1; Economics 1A and 1B recommended. Develops a sociological approach to organizations theory. Designed to introduce sociological concepts, address the alternative psychological and economic models, and involve students in the practice of organizational analysis.

180B. Complex Organizations (4) II. Hackett; III. The Staff

Lecture—3 hours; discussion—1 hour or term paper or research project. Prerequisite: course 180A or consent of instructor. Builds on concepts and skills developed in course 180A. Deals with the issues of organizational decision making, design, and survival. Emphasis on relations between organizations and the effects of those relations in both the public and private sectors.

181. Social Change Organizations (4) III. J. Lofland

Lecture—3 hours; discussion/term paper—1 hour. Prerequisite: course 1. Analysis of organizations with social change and improvement goals and programs, emphasizing voluntary associations and grassroots citizen groups. Topics treated include formation, decision-making and leadership, strategies and tactics, factionalism and coalitions, effectiveness. Offered in alternate years.

***182. Experimental and Utopian Communities (4) III.** Hackett

Lecture—3 hours; discussion—1 hour. The social structure of intentional, experimental or Utopian settlements and communitarian movements, including comparison with other small settlement forms: villages, neighborhoods, monasteries, encampments and nonsettlement communities based on occupation, ethnicity, and religion.

***183. Comparative Organizations (4) III.** Biggart

Lecture/discussion—3 hours; term paper. Prerequisite: course 180A or 180B; upper division standing. Examination of economic and political organizations of major industrial nations. Discussion of historical, cultural, social, and political influences on industrial patterns and practices, alternative theoretical models for explaining differential development. Societies may include Sweden, Japan, Germany, Taiwan, and South Korea. Offered in alternate years.

185. Sociology of Social Welfare (4) I. The Staff; II, III. Joffe

Lecture—3 hours; discussion—1 hour or term paper or research project. Sociological analysis of the evolution and current organization of welfare functions in modern societies.

***189. Social Science Writing (4) II.** Walton

Lecture—3 hours; term paper/discussion—1 hour. Prerequisite: course 46A, upper-division standing, and 12 units of social science. Improved analytic writing and methods for reporting social science research

to a wider public. Sociological analysis of the conditions of good and bad writing. Offered in alternate years.

190X. Upper Division Seminar (1-2) I. The Staff; II. Wolf; III. The Staff

Seminar—1-2 hours. Prerequisite: upper division standing and consent of instructor. In-depth examination at an upper division level of a special topic in Sociology. Emphasis on student participation in learning. May not be repeated for credit. Limited enrollment.

192. Internship and Research Practicum (2-12) I.

The Staff; II. Wolf; III. The Staff
Internship—3-33 hours; discussion—1 hour. Prerequisite: upper division standing; course 46A; approval of proposed internship. Supervised internship and study in an agency, organization or institution; application of core concepts in sociology to the work experience. May be repeated for credit only by permission. Maximum of 4 units of 192 may be counted toward the Sociology major. (P/NP grading only.)

194HA-194HB. Special Study for Honors Students (4-4) I-II. L. Lofland

Seminar—3 hours; term paper. Prerequisite: senior standing and admission to the Honors Program. Directed reading, research and writing culminating in the preparation of a Senior Honors Thesis under direction of faculty adviser. (Deferred grading only pending completion of course sequence.)

197T. Tutoring in Sociology (1-4) I, II, III. The Staff

Tutorial—3-12 hours. Prerequisite: upper division standing; completion of appropriate course with distinction. Activities vary depending on the nature of the course assignment. May include (but not limited to) tutoring on course material, advising on projects and papers, and leading discussion groups. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Block in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Block in charge)

Prerequisite: open to seniors only. (P/NP grading only.)

Graduate Courses**201. Social Research (4) II.** Goldstone

Lecture/discussion—3 hours; term paper. Prerequisite: graduate standing, or consent of instructor. Survey of sociological inquiry, taught as practicum. Philosophy of social science; values and research; research agendas and research problem formulation; research process; explanation vs. interpretation; study design; concept formation, measurement, sampling, data acquisition, inference; rhetoric and presentation of findings.

206. Quantitative Analysis in Sociology (4) III.

Cohen

Lecture—4 hours. Prerequisite: course 106. Survey of the statistical models and methods that serve as a foundation for quantitative research in sociology, with an emphasis on multivariate regression analysis, as well as measurement theory and time series analysis. (S/U grading only.)

***207A-207B. Methods of Quantitative Research (4-4) II-III.** Cohen, Felmlee

Lecture—3 hours; paper. Prerequisite: course 106 or the equivalent. Principles of study design, examination of measurement, survey research methods and multivariate analysis. Course will stress actual practice of techniques. Students will carry out quantitative data analysis using packaged computer programs. (Deferred grading only, pending completion of sequence.)

***215. Economy, Polity, and Society (4) II.** Block

Seminar—3 hours; paper. Prerequisite: consent of instructor. Open to graduate students in sociology and related disciplines. Course introduces students to topics and selected issues in the related fields of economic and political sociology and political economy.

***220. Deviance, Law, and Social Control** (4) I.

Cohen

Seminar—3 hours; projects. Prerequisite: course 120 or consent of instructor. Report and discussions of literature on selected forms of deviance in relation to law and formal social control. Agency contacts and exploratory research projects.

***226. Sociological Social Psychology** (4) I. L.

Lofland

Seminar—3 hours; seminar paper—1 hour. Prerequisite: graduate standing or consent of instructor. Advanced study of the varying approaches, methods, issues and topical concerns of sociological social psychology. Analysis of central and representative historical and contemporary works.

227. Sociology of Reproduction (4) II. Joffe

Lecture—3 hours; discussion—1 hour. Recent social science scholarship in such areas as teenage pregnancy, family planning, abortion, adoption, AIDS, and new reproductive technologies; focus on the current situation in the United States. Offered in alternate years.

***230. Ethnic (Race) Relations** (4) II. Jorgensen

Lecture—3 hours; paper. Advanced study of the determinants of ethnic groupings and their interrelationships. Major theme will be the patterns of ethnic stratification and causes of ethnic conflict. Specific focus upon dominance and resistance to dominance. Influence of social science research.

***234. Gender, Family, and Society** (4) II. Wolf

Seminar—3 hours; seminar paper. Prerequisite: graduate standing or consent of instructor. The major theoretical traditions and concerns in family sociology and sociology of gender. Analysis of selected classical and contemporary works representative of functionalist, Marxist, psychoanalytic, feminist and critical theoretical approaches to these subjects (e.g., Engels, Parsons, Freud, Horkheimer, Goode, Lasch, Mitchell). Emphasis on macro and historical questions.

242A-242B. Comparative Methods in Historical Sociology (4-4) I-II, II-III. Hall

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Comparative approaches to major historical phenomena such as nationalism, bureaucratization, feudalism, and capitalism; the relevance of psychological and sociological theories to historical interpretation; the verifiability of historically grounded hypothesis; the meaning of analogy, correspondence and causality. Offered in alternate years. (If taken as a sequence, deferred grading only, pending completion of sequence.)

***243. Urban Society** (4) L. Lofland

Seminar—3 hours; paper. Broad overview of the issues and concerns of the field of urban sociology. Special emphasis on the human experience of urban living in contemporary, cross-cultural or historical settings.

***245. Developing Societies** (4) III. Walton

Seminar—3 hours; term paper or project. Prerequisite: graduate student status or familiarity with problems of developing societies. Analysis of social and economic problems of developing societies from the standpoint of theory and research on modernization and underdevelopment. Nature of third world dependency and interdependence in the global political economy. Offered in alternate years.

248. Social Movements (4) I. J. Lofland

Seminar—3 hours; paper. Analysis of current issues in and contributions to the study of collective behavior and social movements; particular focus upon the strategies and tactics of social movements.

***254. Sociological Issues in Health Care** (4) I. Roth
Seminar—3 hours; paper. Prerequisite: open to graduate or professional students. Sociological perspectives and methods directed to health care issues. Students select topics for supervised research. The course will have a theme (described in advance) each time it is offered. Paper on research will be required. (S/U grading only.)

255. Sociology of Law (4) III. Melossi

Seminar—4 hours. Prerequisite: consent of instructor. Analysis of the nature of the legal process and its

impact on social behavior. Will consider (1) nature and functions of law, (2) the organization and administration of law, and (3) the capacity of law to affect social behavior.

265A. Classical Sociological Theory (4) I. Walton

Lecture—3 hours; discussion—1 hour. Introduces graduate students to the work of the main classical thinkers in the tradition of social theory, such as Marx, Durkheim, Weber, Simmel, Freud, G.H. Mead, and Parsons, locating them within the historical, cultural, and philosophical milieu in which their ideas originated.

265B. Theory in Contemporary Sociology (4) II.

Walton

Lecture—3 hours; discussion—1 hour. Prerequisite: course 265A. Explores the uses of theories in contemporary sociology by tracing their connections with classical sociological writings and their relations to broader theoretical concerns of contemporary social thought, with particular emphasis on relevance to the current historical, cultural and social milieu.

270. Social Demography (4) III. Cramer

Seminar—4 hours. Prerequisite: course 170 or consent of instructor. How social institutions affect and are affected by the level and variation of mortality, migration, and fertility. Special emphases on the determinants of fertility-related attitudes and behavior, on less-developed countries, and on contemporary empirical studies.

***280. Organizations and Institutions** (4) III. Hackett
Seminar—4 hours. Theory of formal organizations and bureaucracy. Methods of research in organizational and institutional studies. Historical and comparative analysis of political, religious, educational, military, and economic structure.

290. Seminar (4) I, II, III. The Staff (Block in charge)

Seminar—3 hours; term paper. (S/U grading only.)

***292A-292B. Field Research** (4-4) II-III. Joffe, Stacey

Seminar—3 hours; field trips. Prerequisite: graduate standing in Sociology or consent of instructor. The process of collecting, analyzing and reporting qualitative social data: techniques of intensive interviewing, participant-observation and document analysis; generating, developing, and evaluating analytic frameworks; recording, storing, retrieving, and writing up qualitative data. Emphasis on application of principles; each participant completes a field work project. Offered in alternate years. (Deferred grading only, pending completion of sequence.)

293. Proseminar in Sociology (2) I. Jackman

Seminar—2 hours. Prerequisite: first-year Sociology graduate students only. Introduction to graduate training in sociology. A seminar designed to introduce students entering graduate work in the department to its ongoing research activities. (S/U grading only.)

295. Special Topics Seminar (4) I, II, III. The Staff (Chairperson in charge)

Lecture/discussion—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Research topics in sociology. Topic will vary according to faculty interest and student demand.

298. Group Study (1-5) I, II, III. The Staff (Block in charge)

Prerequisite: consent of instructor. (S/U grading only.)

299. Individual Study (1-12) I, II, III. The Staff (Block in charge)

(S/U grading only.)

Professional Course**466. Research Paper Workshop** (2) I. Block

Workshop—1.5 hours; discussion—0.5 hours. Prerequisite: Master of Arts standing. A workshop to assist advanced graduate students in the preparation of an original research paper. Students present their research papers and discuss issues in theory, research design, data, empirical inference, and verbal and written presentation of a professional research paper. (S/U grading only.)

Soil and Water Science

(College of Agricultural and Environmental Sciences)

The Major Program

Soil and water science is concerned with the use and protection of our land and water resources. The major teaches graduates sound scientific principles for managing soil and water resources to benefit both agriculture and the environment.

The Program. Major programs are designed to include land use, soil survey, soil management and conservation, plant nutrition, diagnostic technology, irrigation and drainage, water resources management, water quality, and related environmental problems. (For example, the emphasis on water quality would include more than the minimum number of units of physical and biological sciences, while an emphasis in resource allocation and land-use planning would include more courses in the social, political, and economic areas.)

Internships and Career Alternatives. Before they graduate, many students receive practical work experience through student internships with state and federal agencies, soil and plant labs, and growers. Students also have the opportunity to work on research projects with faculty members and to develop individual research or study topics. Graduates are qualified for managerial and technical positions with environmental and agricultural businesses. They are also prepared for positions in advising, planning, land appraisal, and research and teaching with private, government, and international organizations involved with soil and water development, use, and conservation. Some graduates also continue in master's and doctoral programs in soil science, water science, ecology, and plant physiology.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

UNITS

English Composition Requirement	4-12
See College requirement	0-8
Oral expression (Rhetoric 1)	4
Preparatory Subject Matter	74
Biological sciences (Biological Sciences 1A, 1B, 1C)	15
Chemistry (Chemistry 2A-2B-2C and a more advanced course)	18
Computer science (Agricultural Systems and Environment 21, Engineering 5)	3
Economics or agricultural economics (Economics 1A, 1B)	5
Geology (Geology 50)	3
Mathematics (Mathematics 16A, 16B)	6
Physics (Physics 5A-5B-5C)	12
Statistics (Statistics 13, Agricultural Systems and Environment 120)	4
Additional physical sciences, biological sciences, and/or mathematics with approval of adviser	8
Breadth/General Education	15-33
Satisfaction of General Education requirement	6-24
At least one upper division course from each of the following areas, with approval of adviser, (1) resource management, (2) environmental law, (3) environmental economics and decision making	9
Depth Subject Matter	30
Soil Science 100	4
Hydrologic Science 100	5
Additional upper division units in soil science and hydrologic science	21

Restricted Electives	27
To supplement or expand areas of student interest selected with approval of adviser	24
Special study or experience (192 or 199 course in the major area)	3
Unrestricted electives	4-30
Total Units for the Degree	180

Specific Courses of Instruction. For specific courses of instruction in this major, see course listings under Atmospheric Science, Plant Science, Environmental and Resource Sciences, Soil Science, and Hydrologic Science.

Major Adviser. R. Dahlgren.

Advising Center for the major is located in 148 Hoagland Hall (mornings) or 111A Veihmeyer Hall (afternoons) (916-752-1669).

Graduate Study. Graduate programs are available in Soil Science as well as Hydrologic Science. Detailed information can be obtained from the Graduate Adviser and the *Graduate Announcement*. See also the Graduate Studies section in this catalog.

Related Courses. See courses in Agricultural Economics, Agricultural Systems and Environment, Agronomy, Chemistry, Biological and Agricultural Engineering, Civil and Environmental Engineering, Environmental Studies, Environmental Toxicology, Geology, International Agricultural Development, Plant Biology, Plant Science, Range Science, and Vegetable Crops.

Soil Science

See Soil Science, below; Soil Science (A Graduate Group); and Soil and Water Science

Soil Science

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Land, Air and Water Resources.

Graduate Study. Programs of study leading to the M.S. and Ph.D. degrees in Soil Science are available. Information regarding these programs can be obtained from the graduate adviser and the *Graduate Announcement*. See also the Graduate Studies section in this catalog.

Graduate Adviser. M.J. Singer, (*Land, Air, and Water Resources*).

Courses in Soil Science (SSC)

Questions pertaining to the following courses should be directed to the instructor or to the Resource Sciences Teaching Center, 148 Hoagland Hall (916-752-1669).

Lower Division Courses

10. Concepts of Soil Science (3) I. Dahlgren
Lecture—3 hours; optional Saturday field trip. Not open to students who have received credit for course 100 or similar introductory soil science course. Study of soils as natural bodies formed by interactive environmental processes; their response to use and management; taxonomic and capability classifications; conservation practices for preservation of soil resources. Intended for students with diverse interests and backgrounds. General Education credit: Nature and Environment.

92. Soil Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in soil science. Internship supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Principles of Soil Science (4) I. Singer
Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 1A-1B, Physics 1A-1B, Biological Sciences 1A, and consent of instructor; Geology 50, Biological Sciences 1C, Microbiology 2, and Chemistry 8A recommended. Formation, properties and behavior of soils. Nature and interactions of solid, aqueous, gaseous, and biotic components. Soil-plant-atmosphere relationships. Soil development and geography, management, and conservation.

102. Soil and Water Chemistry (5) II. Zasoski
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 100 or the equivalent preparation in introductory earth science or consent of instructor. Chemical nature of the mineral and organic constituents of soil and of the soil solution; ion exchange and other colloidal phenomena including the effect of soil amendments and fertilizers; microbiological processes in soils.

105. Field Studies of Soil Resources (8) Extra-session summer. Dahlgren, Singer, Southard
On campus—daily 1 week; study tour—daily 5 weeks. Prerequisite: consent of instructor; course 120 recommended. *In situ* soil studies with emphasis on the interactions between soil characteristics and kinds of land use. Field identification and evaluation of soils for agricultural, range, forest, urban, and other uses.

107. Soil Physics (4) I. Rolston
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100, Water Science 100, Mathematics 16A, or the equivalent. Description of soil physical properties. Principles of water, gas, heat, and solute movement in soil with selected examples related to soil and water management. Influence of soil physical properties on transfer processes.

109. Soil Fertility and Fertilizers (4) III. The Staff
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100 or the equivalent preparation in elements of soil science. Forms and availability of plant nutrient elements in soils; effects of fertilizers and soil amendments on crop and soil characteristics; conduct and interpretation of soil fertility assays.

111. Soil Microbiology (4) II. Scow
Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 1C and Biological Sciences 1C. Major groups of microorganisms in soil, their interrelationships, and their responses to environmental variables. Role of microorganisms in cycling of nutrients. Plant-microbe relationships. Transformations of organic and inorganic pollutants.

118. Soils in Land Use and the Environment (4) III. Singer
Lecture—3 hours; discussion—1 hour; two one-day field trips. Prerequisite: course 100 or consent of instructor. Soils are considered as elements in land use planning and environmental quality. Topics include: soil survey reports, remote sensing, land capability classification, soil erosion/conservation, waste disposal on soils and soil reclamation.

120. Soil Genesis, Morphology, and Classification (5) III. Southard
Lecture—4 hours; laboratory—3 hours (includes five one-day weekend field trips). Prerequisite: course 100; Geology 50 recommended. Recognition and description of soils; chemical, biological and physical processes of soil formation. Factors of soil formation. Interactions of soils with diverse ecosystems. Introduction to soil classification. Practice using soil taxonomy. Practical experience describing soil properties in the field.

192. Soil Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off

and on campus in soil science. Internship supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

***207. Transport Processes in Soils** (4) II. Rolston, Hopmans
Lecture—3 hours; discussion/computer laboratory—2 hours. Prerequisite: course 107 and Mathematics 22B; knowledge of a computer programming language. Physical and mathematical description of nonsteady transport processes in soil and the unsaturated zone. Emphasis on analytical and numerical solutions to water, gas, solute (contaminants), and heat transport processes and the chemical and biological reactions attenuating solute movement. Offered in alternate years.

***208. Soil-Plant Interrelationships** (3) II. Richards
Lecture—3 hours. Prerequisite: course 100, Plant Biology 111B, or consent of instructor. Plant needs, occurrence and reactions of water and mineral nutrients in soils; root systems and their growth in soils; mass flow and diffusion mechanisms in nutrient acquisition; models relating nutrient uptake to soil and plant characteristics; nutrient assimilation and crop quality. Offered in alternate years.

***211. Advanced Soil Microbiology** (3) III. Scow
Lecture—3 hours. Prerequisite: Chemistry 8A-8B; course 111; Biochemistry & Biophysics 101A, 101B, or an equivalent course recommended. Microbial metabolism of organic chemicals in soil, both natural and xenobiotic. Decomposition of organic matter. Kinetics of microbial processes in soil. Offered in alternate years.

***214. Soil Mineralogy** (5) III. Dahlgren
Lecture—3 hours; laboratory—6 hours. Prerequisite: course in soil chemistry or consent of instructor. Nature, properties, and occurrence of the common minerals in soils and rocks. Weathering reactions and stability of minerals in the weathering environment. Application of analytical methods in mineral analysis, including x-ray, microscopic and chemical analysis for characterization of mineral systems. Offered in alternate years.

216. Disequilibrium and Aqueous Geochemistry (3) I. Casey
Lecture—3 hours. Prerequisite: course 102 or Chemistry 110A or Geology 115, and Mathematics 119. First half emphasizes equilibrium thermodynamics, including choices of standard states, ideal solutions, and use of the Gibbs-Duhem relation. Second half covers geochemical kinetics including simple rate laws, transition state theory, solute diffusion, and experimental methods.

***218. Soil Erosion and Conservation** (3) II. Singer
Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing; courses 118, 120. Processes of soil erosion by wind and water in agricultural areas, and methods of soil conservation will be discussed. Methods of predicting rates of soil erosion will be considered. Offered in alternate years.

219. Ecosystem Biogeochemistry (4) III. Dahlgren, Bledsoe
Lecture—3 hours; laboratory/discussion—2 hours. Prerequisite: introductory courses in ecology/biology and soils recommended; undergraduates accepted with consent of instructor. Multidisciplinary analysis of energy and nutrient transfers within terrestrial ecosystems. Examination of processes and internal intra-system interactions between the atmosphere, biosphere, lithosphere and hydrosphere. Laboratory section uses biogeochemical simulation models to examine case studies. (Same course as Ecology 219.)

220. Pedology (3) I. Southard
Lecture—3 hours. Prerequisite: consent of instructor; course 120 recommended. Topics selected from studies of soil-forming processes, soil-geomorphic relations, mineral weathering, new developments

in soil classification, and development of pedologic theory. Topics vary from year to year. May be repeated once for credit. Offered in alternate years.

290. Special Topics in Soil Science (1) I, III. The Staff
Seminar—1 hour. Prerequisite: graduate standing. Oral presentation and discussion of scientific material and procedures for review and critique of publications. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Soil Science (A Graduate Group)

Randal J. Southard, Ph.D., Chairperson of the Group
Group Office, 148 Hoagland Hall (916-752-1669)

Faculty. Includes faculty members from the Departments of Biological and Agricultural Engineering; Agronomy and Range Science; Civil and Environmental Engineering; Land, Air, and Water Resources; Nematology; Pomology; Vegetable Crops; and Viticulture and Enology.

Graduate Study. The Graduate Group in Soil Science offers programs of study and research leading to the M.S. and Ph.D. degrees. Soil science focuses on the physical, chemical and biological processes that govern the quality and distribution of soils in relation to landform evolution, geochemical environments, and organism habitats. Research in soil science includes the study of soil as a global natural resource, as a critical component of the environment, and as a resource to sustain agricultural and wildland ecosystems. Students may specialize in: environmental quality; soil physics; soil chemistry; soil genesis, morphology and classification; soil fertility and plant nutrition; soil microbiology and biochemistry; soil-plant-water relationships; or general soil science. For detailed information regarding the programs, address the chairperson of the group.

Graduate Advisers. Consult the Group Office.

Spanish

(College of Letters and Science)

Manfred Kusch, Ph.D., Chairperson of the
Department

Department Office (Spanish and Classics), 616
Sproul Hall (916-752-0835)

Faculty

Marta E. Altisent, Ph.D., Associate Professor
Samuel G. Armistead, Ph.D., Professor
Robert Blake, Ph.D., Professor
Cecilia Colombi, Ph.D., Assistant Professor
Linda Egan, Ph.D., Assistant Professor
Zunilda Gertel, Ph.D., Professor
Germán Gullón, Ph.D., Professor
Almerindo E. Ojeda, Ph.D., Associate Professor
(Linguistics)

Fabián A. Samaniego, M.A., Senior Lecturer
Robert M. Scari, Ph.D., Professor
Máximo Torreblanca, Ph.D., Professor (Linguistics)
Hugo J. Verani, Ph.D., Professor

Emeriti Faculty

Donald G. Castanien, Ph.D., Professor Emeritus
Mario González, Ph.D., Lecturer Emeritus
Dacier T. Jaén, Ph.D., Professor Emeritus
Daniel S. Keller, Ph.D., Professor Emeritus
Antonio Sánchez-Romero, Ph.D., Professor Emeritus

The Major Program

The major program is designed to assure proficiency in all four language skills—speaking, understanding, reading, and writing—and to acquaint students with the intellectual and cultural contributions of the Spanish-speaking world through a study of its language, literature, and traditions.

The Program. The department's lower division program gives students a solid foundation in the Spanish language, either through the traditional elementary and intermediate language series or through an accelerated three-course sequence of Spanish for native speakers. Linguistics 1 introduces students to a systematic study of language in general and serves as an introduction to upper division courses in Spanish linguistics. At the upper division level, students receive a broad introduction to basic concepts and the practice of literary criticism and to the four areas of study represented in the department's curriculum: Spanish linguistics, Spanish literature, Spanish-American literature, and Hispanic literatures and cultures in the United States. Students are encouraged to work closely with the department's academic advisers in designing a program of studies tailored to their individual needs and interests. Many students combine the Spanish major with another major in the humanities or social sciences. The department encourages its majors to consider summer study in a Spanish-speaking country or to spend their junior year with the Education Abroad Program in Spain, Mexico, or other Spanish-speaking countries.

Career Alternatives. The program, alone or in combination with other major programs, may lead to advanced study of the language or literature of Spain and Spanish America, and to careers not only in teaching, but also in other professions such as library science, law, medicine, and in government, social service, or business.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	4-37
Spanish 1, 2, 3, 21, 22, 23, and 24	0-33
or Spanish 31, 32, 33	0-15
Linguistics 1	4
In consultation with a departmental adviser and with the consent of the department chairperson, Linguistics 1 may be taken concurrently with upper division courses.	

Depth Subject Matter	45-48
One course in each of the following five areas	
Spanish 100	4
Spanish 111N, 115N, or 116	3-4
Spanish 130, 131N, or 134N	4
Spanish 150N, 151N, or 157	4
Spanish 117, 174, or 176	4

Seven elective courses to be chosen in consultation with the student's major adviser

26-28
Students are strongly encouraged to concentrate their elective courses in one or two of the following areas (other combinations are possible with the approval of the adviser):

- Spanish literature
- Spanish-American literature
- Chicano literature
- Spanish linguistics

Students may, with the approval of their adviser, take up to three elective courses outside the Spanish department in such programs as Anthropology (e.g., Anthropology 144), Chicano Studies (e.g., Chicano Studies 154, 155, 156), Comparative Literature, History (e.g., History 161A, 161B, 164, 165, 166A, 166B, 168W, 169A, 169B, 170), and Linguistics (e.g., Linguistics 115, 116). Given the great flexibility in the Spanish major, it is important that students design their programs in close consultation with their major adviser. This is especially important for students who

intend to use their major as preparation for graduate studies or who are planning a teaching career.

Total Units for the Major

49-85
Major Advisers. M.E. Altisent, C. Colombi, R. M. Scari (Master Adviser), H. Verani.

Minor Program Requirements:

	UNITS
Spanish	23-24
One course in each of the following five areas	
.....	23-24
Spanish 100	4
Spanish 111N, 115, or 116	3-4
Spanish 130, 131N, or 134N	4
Spanish 150N, 151N, or 157	4
Spanish 117, 174, or 176	4
One upper division elective in Spanish	4

Prerequisite credit. Credit normally will not be given for a course if that course is the prerequisite of a course already successfully completed. Exceptions can be made by the Department Chairperson only.

Honors Program. Candidates for high or highest honors in Spanish must write a senior thesis under the direction of a faculty member. For this purpose, honors candidates must enroll in at least six units of Spanish 194H distributed over two quarters. Normally, a student will undertake the honors project during the first two quarters of the senior year; other arrangements must be authorized by the department chair. Only students who, at the end of their junior year (135 units), have attained a cumulative grade-point average of 3.5 in courses required for the major will be eligible for the honors program. The requirements for earning high and highest honors in Spanish are in addition to the regular requirements for the major in Spanish.

Teaching Credential Subject Representative. C. Colombi. See also under Teacher Education Program.

The Master of Arts Degree. The Department offers courses leading to the M.A. degree in Spanish to students who have completed with distinction the A.B. degree in Spanish, or the equivalent. Candidates will be recommended for admission to graduate studies in Spanish provided they meet the requirements of the Graduate Studies Office and the Department of Spanish. Detailed information may be obtained by writing to the Chairperson of the Spanish Department.

The Degree of Doctor of Philosophy. The Department offers programs of study and research leading to the Ph.D. degree. Detailed information may be obtained by writing to the Chairperson of the Spanish Department.

Graduate Adviser. Consult department.

Courses in Spanish (SPA)

Course placement: Students with two years of high school Spanish normally take Spanish 2, those with three years take Spanish 3, and those with four years take Spanish 21. It is recommended that transfer students who have successfully completed a two-year sequence at the junior college level continue their study by taking Spanish 24 or 100.

Lower Division Courses

1. Elementary Spanish (5) I, II, III. The Staff (Samaniego in charge)

Discussion—5 hours; laboratory—1 hour. Introduction to Spanish grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed Spanish 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Spanish (5) I, II, III. The Staff (Samaniego in charge)

Discussion—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of course 1 in the areas of grammar and basic language skills.

3. Elementary Spanish (5) I, II, III. The Staff (Samaniego in charge)

Discussion—5 hours; laboratory—1 hour. Prerequisite: course 2. Completion of grammar sequence and continuing practice of all language skills through cultural texts.

8. Elementary Spanish Conversation (2) I, II, III. The Staff

Discussion—3 hours. Prerequisite: course 3; course 21 (concurrently) recommended. Designed to develop oral communication skills. Emphasis on increasing vocabulary, improving listening comprehension, pronunciation, accuracy and grammar control. Practice of everyday situations. Not open to native speakers or to upper division students.

21. Intermediate Spanish (5) I, II, III. The Staff

Lecture/discussion—5 hours; laboratory—1 hour. Prerequisite: course 3. Designed to review and develop the grammar, vocabulary and composition acquired in the first year through exercises and reading of modern texts. It is recommended that students transferring from other institutions start the second-year program at this point. (Former course 4.)

22. Intermediate Spanish (5) I, II, III. The Staff

Lecture/discussion—5 hours; laboratory—1 hour. Prerequisite: course 21. Continuation of Spanish 21. Focus on more difficult grammatical concepts and further practice in composition. Development of all language skills through exercises and reading of modern texts. (Former course 5.)

23. Spanish Composition I (4) I, II, III. Colombi in charge

Lecture—3 hours; frequent writing assignments. Prerequisite: course 22. Development of writing skills by way of reading, discussion, and analysis of authentic materials, literary texts, and videos. Selective review of grammar. Composition, journals, individual and group projects.

24. Spanish Composition II (4) I, II, III. Colombi in charge

Lecture—3 hours; term paper. Prerequisite: course 23. Development of advanced level writing skills, with particular emphasis on how to write argumentative prose, essays, and research papers. Introduction to the analysis of literary genres. Compositions, journals, individual and group projects.

28. Intermediate Spanish Conversation (2) I, II, III. Blake in charge

Discussion—3 hours. Prerequisite: course 8 or 22. Continuation of course 8. Designed to develop oral communication skills at a more advanced level. Practice in more complex situations. (Former course 9.)

31. Intermediate Spanish for Native Speakers I (5). I. The Staff

Lecture/discussion—3 hours; tutorial—1 hour; frequent writing assignments. Prerequisite: course 3 or the equivalent, or consent of instructor. First course of a three-quarter series designed to provide bilingual students whose native language is Spanish with the linguistic and learning skills required for successfully completing upper division courses in Spanish. Intensive review of grammar and composition. (Former course 7A.)

32. Intermediate Spanish for Native Speakers II (5). II. The Staff

Lecture/discussion—3 hours; tutorial—1 hour; frequent writing assignments. Prerequisite: course 31 or consent of instructor. Continuation of intensive review of grammar and composition. Development of all language skills through reading of modern texts, presentation/discussion of major ideas, vocabulary expansion, and writing essays on topics discussed. Designed for students whose native language is Spanish. (Former course 7B.)

33. Intermediate Spanish for Native Speakers III (5) III. The Staff

Lecture/discussion—3 hours; tutorial—1 hour; frequent writing assignments. Prerequisite: course 32 or consent of instructor. Development of writing skills, with emphasis on experimenting with various writing styles: analytical, argumentative, and creative. Analytical review of literary genres. Written essays will be assigned. Students will develop a research paper. Designed for students whose native language is Spanish. (Former course 7C.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor and Department Chairperson. Primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

Course 100 is prerequisite to all upper division literature courses.

100. Principles of Hispanic Literature and Criticism (4) I, II, III. Altisent, Gullón, Verani

Lecture—3 hours; term paper. Prerequisite: course 24 or 33. Principles of literary criticism applied to the study of fiction, drama, poetry and essay of major literary writers of the Hispanic world.

110. Advanced Spanish Composition (4) I, II, III. Scari

Lecture—3 hours; frequent writing assignments. Prerequisite: course 24 or 33. Practice in expository writing with emphasis on clarity and idiomatic expression. Practical application and review of selected grammar topics. (Part of former courses 110A and 110B.)

111N. The Structure of Spanish: Sounds and Words (3) I, II, III. The Staff

Lecture—3 hours. Prerequisite: Linguistics 1 and course 24 or 33, or consent of instructor. A linguistic description of the sound patterns of Spanish and how those sounds can be used to form larger units, such as morphemes and words. Theoretical and practical comparisons with English and with other Romance languages. (Former course 132.)

112N. The Structure of Spanish: Words and Phrases (3) I, II, III. Blake, Ojeda

Lecture—3 hours. Prerequisite: course 111N. A study of Spanish word and phrase structure, with special emphasis on the constituent structure of noun and verb phrases. Theoretical and practical comparisons with English and with other Romance languages. (Former course 131.)

113. Spanish Pronunciation (3) I, II. Torreblanca

Lecture—3 hours. Prerequisite: course 24 or 33, or consent of instructor. The sound structure of modern Spanish; theoretical analysis of selected problems in pronunciation. Strongly recommended for prospective teachers. (Former course 133.)

114N. Contrastive Analysis of English and Spanish (4) III. Colombi, Ojeda

Lecture—3 hours; term paper. Prerequisite: course 24 or 33, or consent of instructor. Contrastive analysis of English and Spanish, error analysis, introduction of structuralist and transformational linguistics. Individual and group conferences; substantial written work. (Former course 137.)

115N. How Spanish Grew: Its Origins and Development (4) I, II. Blake, Torreblanca

Lecture—3 hours; term paper. Prerequisite: course 24 or 33 and Linguistics 1, or consent of instructor. The Spanish language from its roots in spoken Latin to modernity. Course stresses the close relationship between historical events and language change, as well as the role that literature plays in language standardization.

116. Applied Spanish Linguistics (4) I, II. Blake, Colombi

Lecture—3 hours; term paper. Prerequisite: course 24 or 33, or consent of instructor. An exploration of the major theoretical and practical issues concerning learning Spanish as a second language. Especially

designed for students interested in teaching Spanish as a career.

117. Teaching Spanish as a Native Tongue in the U.S.: Praxis and Theory (4) I. Colombi, Alarcón

Lecture—3 hours; term paper. Prerequisite: course 24 or 33, or consent of instructor; course 116 and Linguistics 116 recommended. Designed for students interested in teaching Spanish to native speakers. Focus on cultural diversity of the main Spanish-speaking populations in the U.S.; applied language teaching methodologies in the context of teaching Spanish to native speakers at different levels. Conducted primarily in Spanish.

118. Topics in Spanish Linguistics (4) III. The Staff

Lecture—3 hours; term paper. Prerequisite: courses 111 and 112. A study of specialized topics in Spanish linguistics, for example: language and use; text and context; language and society; bilingualism; Spanish dialectology; syntax and semantics. May be repeated once for credit when topic differs.

123. Creative Writing in Spanish (4) III. Alarcón

Discussion—4 hours. Prerequisite: course 24 or 33, or consent of instructor. Intensive writing of poetry or fiction in Spanish or in a bilingual (Spanish/English) format. Students will write both in prescribed forms and in experimental forms of their own choosing. Offered in alternate years.

130. Survey of Spanish Literature to 1700 (4) I. Gullón

Lecture—3 hours; term paper. Prerequisite: course 100. Survey of Spanish literature (narrative, poetry and drama) to 1700, Emphasis on the multicultural birth of the Spanish culture, the formation and growth of the Spanish language and letters through its written records and the literature of the early period. (Part of former courses 103A and 103B.)

131N. Survey of Spanish Literature 1700 to Present (4) II. Gullón

Lecture—3 hours; term paper. Prerequisite: course 100. Survey of modern Spanish literature, providing an overview of main literary movements (romanticism, realism, naturalism, modernism, avant-garde). Emphasis on the philosophical and historical background and on the European context for modern Spanish literature. (Part of former courses 104A and 104B.)

132N. Medieval and Renaissance Spanish Literature (4) I. Armistead

Lecture—3 hours; term paper. Prerequisite: course 100. Introduction to the study of the principal works and authors of Medieval and early 16th-century Spanish literature. (Part of former courses 112 and 103A.)

133N. Golden Age Literature of Spain (4) I. Altisent

Lecture—3 hours; term paper. Prerequisite: course 100. Introduction to the study of the principal authors and literary movements of 16th- and 17th-century Spain and Spanish American colonial literature. (Part of former courses 103B, 109 and 115.)

134N. Don Quijote (4) II. Gullón

Lecture—3 hours; term paper. Prerequisite: course 100. A critical reading of *Don Quijote* by Cervantes. Focused interpretations of important passages and characters in the context of the socio-cultural background of the period. *Don Quijote* as prototype for the modern novel. (Former course 111.) Offered in alternate years.

135N. Spanish Romanticism (4) III. Gullón, Scari

Lecture—3 hours; term paper. Prerequisite: course 100. Romanticism as a philosophical concept, and as a literary movement in Spain, with emphasis on its distinctive, specific "Romantic" qualities and its literary expression in five leading authors of the early nineteenth century. (Former course 114.)

136N. The Spanish Novel of the 19th Century (4) II. Gullón, Scari

Lecture—3 hours; term paper. Prerequisite: course 100. Literary realism in Spain, focusing on Leopoldo Alas (Clarín), Emilia Pardo Bazán and Benito Pérez Galdós. The unique characteristics of Spanish realism and its historical roots in Cervantes and the picaresque. (Former course 119.)

137N. Twentieth-Century Spanish Fiction (4) III.

Altisent

Lecture—3 hours; term paper. Prerequisite: course 100 or 131. Study of the main literary trends and authors of the modern Spanish novel and short story. Selected works by Unamuno, Valle-Inclán, Sender, Cela, Matute, Ayala and others. (Former course 120A.)

138N. Modern and Contemporary Spanish Poetry (4) III.

Altisent

Lecture—3 hours; term paper. Prerequisite: course 100 or 131. Study of the main literary trends and authors of modern and contemporary Spanish poetry. Selected works by Machado, Juan Ramón Jiménez, García Lorca, Guillén, Alexandre, Hernández, Hierro and others. (Former course 120C.) Offered in alternate years.

139. Modern Spanish Theater (4) I.

Altisent

Lecture—3 hours; term paper. Prerequisite: course 100. Study of the main dramatic trends and playwrights of modern Spanish theater. Selected works by Valle-Inclán, García Lorca, Mihura, Buero-Vallejo, Arrabal and others. (Former course 120B.) Offered in alternate years.

140N. Modern Spanish Essay (4) II.

Scari

Lecture—3 hours; term paper. Prerequisite: course 100. Ortega, Unamuno and the modern Spanish essay. Their concept of Spain and their relations with other movements and thinkers.

141. Spanish Culture (4) III.

The Staff

Lecture—3 hours; term paper. Prerequisite: course 24 or 33. The development of Spanish culture(s) from the Romans to the present, focusing on important historical periods. Topics include art, history of ideas, and everyday cultural manifestations. (Former course 134.) Offered in alternate years.

142. Special Topics in Spanish Cultural and Literary Studies (4) I, II, III.

The Staff

Lecture—3 hours; term paper. Prerequisite: course 100. Special topics in the study of Spanish literature and culture. May be repeated twice for credit when topic differs. (Part of former course 151.)

149. Latin-American Literature in Translation (4) III.

Gertel, Verani

Lecture—3 hours; term paper. Prerequisite: course 100. Reading, lectures, and discussion in English of works by Neruda, Vallejo, Borges, García Márquez, Paz, and others. May not be counted toward major in Spanish. Offered in alternate years. General Education credit: Civilization and Culture.

150N. Survey of Spanish-American Literature to 1900 (4) I.

Gertel, Verani

Lecture—3 hours; term paper. Prerequisite: course 100. Spanish American literature from prehispanic texts and the Chronicles of the Conquest to Romanticism and Modernism. Reading selections include fiction, poetry, drama and essays. (Former course 105A.)

151N. Survey of Spanish-American Literature 1900 to Present (4) II.

Egan, Gertel, Verani

Lecture—3 hours; term paper. Prerequisite: course 100. Spanish-American literature from Modernism to the present. Reading selections include fiction, poetry, drama, and essays. (Former course 105B.)

153. Spanish-American Short Story (4) I.

Gertel, Verani

Lecture—3 hours; term paper. Prerequisite: course 100. The evolution of the Spanish-American short story during the 19th and 20th centuries. Emphasis on the contemporary period. (Former course 128.) Offered in alternate years.

154. Spanish-American Novel (4) II.

Egan, Gertel, Verani

Lecture—3 hours; term paper. Prerequisite: course 100. The evolution of the Spanish-American novel during the 19th and 20th centuries. Emphasis on significant contemporary works. (Part of former courses 108A and 108B.) Offered in alternate years.

155. Mexican Novel (4) II.

Egan, Gertel, Verani

Lecture—3 hours; term paper. Prerequisite: course 100. The evolution of the Mexican novel during the

19th and 20th centuries. Emphasis on the narrative of the Revolution and significant contemporary works. (Former course 129.)

156. Darío, Modernism and Its Legacy (4) II.

Egan, Gertel, Verani

Lecture—3 hours; term paper. Prerequisite: course 100. Modernism as an authentic expression of Latin American literature and its influence on 20th-century poetry and prose. In depth analysis of the works of Darío and other major Modernist writers. (Former course 125.) Offered in alternate years.

157. 20th Century Masters in Spanish-American Literature (4) III.

Gertel, Verani

Lecture—3 hours; term paper. Prerequisite: course 100. Study of 20th-century Spanish-American writers and their cultural and literary milieus. (Part of former courses 127 and 138.) Offered in alternate years.

158. Spanish-American Poetry: From Vanguardism to Surrealism and Beyond (4) II.

Gertel, Verani

Lecture—3 hours; term paper. Prerequisite: course 100. Study of vanguardism, surrealism, and more recent movements of 20th century poetry. An in depth analysis of the works of such major poets as Neruda, Vallejo, and Octavio Paz. Offered in alternate years.

159. Special Topics in Spanish-American Literature and Culture (4) I, II, III.

Egan, Gertel, Verani

Lecture—3 hours; term paper. Prerequisite: course 100. Special topics in the study of Spanish-American literature and culture. May be repeated twice for credit when topic differs. Offered in alternate years.

170. Spanish-American Culture (4) III.

Colombi

Lecture—3 hours; term paper. Prerequisite: course 24 or 33. Major developments in the arts and social institutions of Spanish America and areas other than Mexico. Readings, lectures and discussions in Spanish. (Former course 136.)

172. Mexican Culture (4) III.

Egan, Gertel, Verani

Lecture—3 hours; term paper. Prerequisite: course 24 or 33. The development of Mexican culture from the Aztec-Mayan era to the present. Study includes important periods such as the Conquest and Colonialism, the Independence movement, and changes from the Revolution to contemporary Mexico. Reading, lectures and discussions in Spanish. (Former course 135.)

174. Chicano Culture (4) II.

Alarcón

Lecture—3 hours; term paper. Prerequisite: course 24 or 33. An interdisciplinary survey of Chicano culture. Topics include literature, art, folklore, oral tradition, music, politics, as well as everyday cultural manifestations. Conducted in Spanish. (Former course 124.)

176. Literature in Spanish Written in the United States (4) III.

Alarcón

Lecture—3 hours; term paper. Prerequisite: course 24 or 33. Survey of the literary and cultural contributions of the main Spanish-speaking populations present in the U.S.: Chicanos, Puerto Ricans, Cuban-Americans, Central Americans, and other Latinos.

192I. Internship in Spanish (1-12) I, II, III.

The Staff (Chairperson in charge)

Independent study—3-36 hours. Prerequisite: course 23; junior standing; major in Spanish, Chicano Studies, or a related field. Internships in fields where Spanish language skills can be used and perfected (teaching, counseling, translating-interpreting). May be repeated for credit for a total of 8 units. Units will not count toward the Spanish major. (P/NP grading only.)

194H. Special Study for Honors Students (1-5) I, II, III.

The Staff

Independent study—3-15 hours. Prerequisite: Open only to majors with senior standing who qualify for honors program. Guided research, under the direction of a faculty member, leading to a senior honors thesis on a topic in Hispanic literature, civilization, or language studies. (P/NP grading only.)

197T. Tutoring in Spanish (1-4) I, II, III.

The Staff

Tutorial—1-4 hours. Prerequisite: Upper division standing and permission of the chair. Tutoring in undergraduate courses including leadership in small voluntary discussion groups affiliated with depart-

mental courses. May be repeated for credit for a total of 6 units. (P/NP grading only.)

197TC. Tutoring in the Community (2-4) I, II, III.

The Staff

Tutorial—2-4 hours. Prerequisite: Upper division standing and permission of the chair. Tutoring in public schools under the guidance of a regular teacher and supervision by a departmental faculty member. May be repeated for credit for a total of 6 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III.

The Staff

(Chairperson in charge)

Prerequisite: consent of instructor and Department Chairperson. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III.

The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses**201. Literary Theory I (4) II.**

Altisent, Gertel, Gullón

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Basic theories and practical approaches to modern and contemporary Hispanic literature. Emphasis on formalism, poststructuralism, socio-cultural discourses, and ideologies.

201. Literary Theory II (4) II.

Gertel, Gullón, Verani

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Major contemporary critical theories including recent, innovative approaches to Hispanic literature and culture. Readings from Semiotics and Deconstructionism to Psychological and Socio-ideological approaches. Emphasis on Postmodern and Neo-colonial discourse.

202. Literary Theory II (4) III.

Gertel, Gullón, Verani

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Major contemporary critical theories including recent, innovative approaches to Hispanic literature and culture. Readings from Semiotics and Deconstructionism to Psychological and Socio-ideological approaches. Emphasis on Postmodern and Neo-colonial discourse.

205. Spanish Phonology (4) II.

Torreblanca

Seminar—3 hours; term paper. Prerequisite: some knowledge of phonetics is required and consent of instructor; Linguistics 109 and 139 highly recommended. Analyzes the sound patterns of Spanish from both linear and non-linear perspectives. Students will develop a clear understanding of what phonology is and the nature of Spanish phonology, as defined by modern linguistic analysis.

206. Spanish Syntax (4) I.

Blake, Ojeda

Seminar—3 hours; term paper. Prerequisite: Linguistics 140 and 165. An examination of Spanish word order within the framework of general linguistic theory. The student will investigate how to write a grammar of Spanish with particular attention to the structure of noun and verb clauses.

207. History of the Spanish Language (4) I, III.

Blake, Torreblanca

Seminar—3 hours; term paper. Prerequisite: Latin 1. (Former course 220A.)

208. Old Spanish Texts (4) II.

Torreblanca, Blake

Seminar—3 hours; term paper. Prerequisite: course 207. An in-depth linguistic examination of Old Spanish texts from the 12th to the 15th centuries, with particular attention to the significance of orthographic changes.

211. Hispanic Dialectology (4) III.

Torreblanca

Seminar—3 hours; term paper. Prerequisite: course 220 or consent of instructor. Descriptive and historical study of the distinctive features of Peninsular and American Spanish dialects. (Former course 221.)

212. Applied Linguistics (4) II.

Colombi, Blake

Seminar—3 hours; term paper. Prerequisite: graduate standing and course 215 and 216. Focuses on the relevant linguistic aspects of teaching Spanish. Designed for graduate students who have an interest in second-language learning and teaching.

215. Special Topics in Hispanic Linguistics (4) III.

The Staff

Seminar—3 hours; term paper. Prerequisite: courses 205, 206 and consent of instructor. Specialized topics

in Hispanic linguistics (e.g., pragmatics, sociolinguistics, topics in syntax, semantics, or diachronic studies). May be repeated for credit when topic differs.

222. Critical Approaches to Spanish Literature I: Prose and Essay (4) II. Altisent, Armistead, Gullón, Scari

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. A review of the main critical approaches to Spanish narrative and the essay.

223. Critical Approaches to Spanish Literature II: Poetry and Drama (4) II. Altisent, Armistead, Gullón, Scari

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. A review of the main critical approaches to Spanish poetry and drama.

224. Studies of a Major Writer, Period, or Genre in Spanish Literature (4) III. The Staff

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Artistic development of a major Spanish writer and his/her intellectual and literary milieu or study of a special topic, period, or genre. May be repeated for credit with consent of instructor.

252. Medieval Spanish Literature: Prose (4) I. Armistead

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. An exploration of the major genres of Medieval Spanish prose from its origins to 1450.

253. Medieval Spanish Literature: Epic (4) II. Armistead

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Medieval Spanish epic narratives. Major theoretical perspectives on the genesis, diffusion, and character of the Medieval epic. Relationship of epic to ballad literature.

254. Medieval Hispanic Lyric (4) II. Armistead

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Analysis of the most representative lyric poetry in the various Peninsular languages and in provençal, troubadour poetry, kharjas, villancicos, cantigas de amigo, and courtly lyric.

255. Spanish Literature of the Early Renaissance (4) I. Armistead

Seminar—3 hours; term paper. Spanish Literature, 1450-1550, with emphasis on *La Celestina*. (Former course 229.)

256. Spanish Literature of the Renaissance and Golden Age: Poetry (4) I. The Staff

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Extensive critical study of the main currents of Renaissance and Baroque Spanish poetry through its language structures, styles ("Culteranismo-Conceptismo"), rhetorical devices, myths, and themes (love, death, time).

257. Spanish Literature of the Renaissance and Golden Age: Drama (4) I. The Staff

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. An exploration of major 16th and 17th century literary and cultural developments through the study of selected dramas.

258. Spanish Literature of the Renaissance and Golden Age: Prose (4) I. The Staff

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. The origins and development of the Spanish novel during the Renaissance and the Spanish Golden Age.

259. Cervantes and the Novel (4) I. Altisent, Armistead, Gullón

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. The narrative works of Miguel de Cervantes with special emphasis on *Don Quijote*.

260. Modern Spanish Literature (4) I. Gullón, Scari, Altisent

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Topics of Spanish literature, from 1700-1920.

261. Contemporary Spanish Literature: Poetry (4) I. Gullón, Altisent

Seminar—3 hours; term paper. Prerequisite: graduate

standing or consent of instructor. Critical analysis of modern Spanish poetry from a wide spectrum of poetic currents.

262. Contemporary Spanish Literature: Narrative (4) I. Altisent, Gullón

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Study of the 20th-century novel, and short story, with emphasis on the avant-garde, existentialism, social realism, and post-modern trends.

263. Contemporary Spanish Literature: Drama (4) I. Altisent

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. The Spanish theatrical production of the last 70 years.

264. Contemporary Spanish Literature: Essay (4) III. Gullón, Scari

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Major thinkers from Ganivet to Unamuno and Ortega y Gasset. Emphasis will be placed on the relationships between Spanish thought and European philosophical currents. Offered in alternate years.

265. Women Writers of Spain (4) I. Altisent, Gullón

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Introduction to the development of a feminine consciousness in the Spanish contemporary literary scene. Selected texts represent particularly innovative typologies of feminine discourse in the realm of the historical, psycho-analytical, and metafictional, erotic, and allegorical fiction.

272. Critical Approaches to Spanish-American Literature: Narrative (4) I. Egan, Gertel, Verani

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Extensive critical study of the development of Spanish-American literary periods and currents in narrative (novel, short story, and essay), from early Colonial times to the present.

273. Critical Approaches to Spanish-American Literature: Poetry and Drama (4) I. Egan, Gertel, Verani

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Extensive critical study of the development of Spanish-American literary periods and currents in poetry and drama, from early Colonial times to the present.

274. Studies of a Major Writer, Period, or Genre in Spanish-American Literature (4) I. The Staff

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Artistic development of a major Spanish-American writer and his/her intellectual and literary milieu or study of a special topic, period, or genre. May be repeated for credit with consent of instructor.

275. Colonial Literature (4) I. Egan, Gertel, Verani

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. An examination of pre-Hispanic and Colonial narrative, poetry and theatre. Emphasis on historical, anthropological, and ethnographic approaches to Colonial discourse.

276. Twentieth-Century Spanish-American Drama (4) III. Gertel

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Major Spanish-American dramatists from Florencio Sánchez to the present. Offered in alternate years. (Former course 240.)

277. Spanish-American Novel, 1900-1950 (4) I. Gertel, Verani

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Study of main trends and key authors in Spanish-America in the first half of the 20th century. Offered in alternate years. (Former course 241A.)

278. New Trends in Spanish-American Fiction (4) II. Gertel, Verani

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Recent developments in Spanish-American narrative. Emphasis on innovative language and structure. Offered in alternate years. (Former course 241B.)

279. Mexican Narrative (4) III. Egan, Gertel, Verani
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Study of the evolution of Mexican narrative. Emphasis on the narrative of the Revolution and significant contemporary works. Offered in alternate years.

280. Spanish-American Short Story (4) III. Gertel, Verani

Seminar—3 hours; term paper. Works by major writers with emphasis on 20th-century authors such as Quiroga, Borges, García Márquez, Cortázar, and Rulfo. (Former course 243.)

281. Spanish-American Women Writers (4) I.

Egan, Gertel, Verani
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Study of feminist critical theories, gender construction, and self-representation within the history of socio-cultural changes in Latin America.

282. Darío and Modernism (4) I. Gertel, Verani

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Study of poetry and prose of Spanish-American Modernism (1880-1916). Offered in alternate years. (Former course 245.)

283. New Directions in Spanish-American Poetry (4) III. Gertel, Verani

Seminar—3 hours; term paper. Offered in alternate years. (Former course 247.)

284. The Spanish-American Essay (4) II. Gertel, Verani

Seminar—3 hours; term paper. Major Spanish-American essayists from Sarmiento to Octavio Paz. Offered in alternate years. (Former course 248.)

298. Group Study (1-5) I, II, III. The Staff
Prerequisite: graduate standing or consent of instructor. May be repeated for credit. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

300. The Teaching of Spanish (3) III. Samaniego
Lecture—3 hours. Prerequisite: senior or graduate standing; a major or minor in Spanish.

390. Problems in Teaching Spanish at the College Level (4) III. Samaniego

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: graduate standing. Theoretical instruction in modern teaching methods and demonstration of their practical application. Required of graduate teaching assistants.

392. Teaching Spanish at the Intermediate College Level (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: course 390A, 390B. Theoretical instruction in intermediate teaching methods and their practical application. Intended primarily for graduate teaching assistants.

Speech

See Rhetoric and Communication

Statistics

(Intercollege Division)

George G. Roussas, Ph.D., Chairperson of the
Division and Associate Dean of Statistics

Division Office, 469 Kerr Hall (916-752-2361)

Faculty

P.K. Bhattacharya, Ph.D., Professor
 Prabir Burman, Ph.D., Associate Professor,
 Christiana Drake, Ph.D., Assistant Professor,
 Alan P. Fenech, Ph.D., Associate Professor
 Wesley O. Johnson, Ph.D., Professor
 Yue-Pok (Ed) Mack, Ph.D., Professor
 Hans-Georg Mueller, Ph.D., Professor
 George G. Roussas, Ph.D., Professor
 Francisco J. Samaniego, Ph.D., Professor
 Robert H. Shumway, Ph.D., Professor
 Jessica M. Utts, Ph.D., Professor, *Academic Senate*
Distinguished Teaching Award
 Jane-Ling Wang, Ph.D., Professor

Emeriti Faculty

Alvin D. Wiggins, Ph.D., Professor Emeritus

The Major Program

Statistics enables us to make inferences about entire populations, based on samples extracted from those populations. Statistical methods can be applied to problems from almost every discipline and they are vitally important to researchers in agricultural, social, engineering, and medical sciences.

The Program. Statistics majors may receive either a Bachelor of Arts or a Bachelor of Science degree. The A.B. degree is very flexible, facilitating a double major or extensive elective coursework in a field in which statistics is applied. The B.S. degree program has two options: one emphasizes mathematics and is especially recommended as preparation for graduate study in statistics; the other emphasizes computer science. All three programs require theoretical and applied course work and underscore the strong interdependence of statistical theory and the applications of statistics.

Preparatory Requirements. Before applying for either the A.B. or B.S. major in Statistics, students must ordinarily complete the following courses with at least C grades:

Mathematics 21A, 21B, 21C
 Mathematics 22A, 22B
 Computer Science Engineering 30 or
 Engineering 5
 Statistics 32

In addition, due to space limitation in the B.S. major, students admitted to this major will normally be chosen from those having at least a 3.0 grade-point average in the above courses. For further information, please contact a Statistics adviser.

Career Alternatives. Probability models and statistical methods are used in a great many fields, including the biological and social sciences, business and engineering. The wide applicability of statistics has created in both the public and private sectors a strong demand for graduates with statistical training. Current employment opportunities include state and federal government positions with a statistician designation, industrial positions (e.g., in the actuarial series within an insurance company or in the data management unit in a health science facility), and teaching positions.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter24-25
 Calculus, Mathematics 21A, 21B, 21C12
 Linear algebra, differential equations, Mathematics 22A, 22B6
 Computer science, Computer Science Engineering 30 or Engineering 5 (or the equivalent)3-4

Statistics through computers, Statistics 323

Depth Subject Matter38-39

Analysis of variance, multiple regression, Statistics 106, 108 or the equivalent8
 Probability and mathematical statistics, Statistics 131A, 131B, 131C12
 Three Statistics courses with Statistics 131B as a prerequisite9-10
 Related elective courses9
 Three upper division courses approved by major adviser. They may be in mathematics, computer science or in quantitative aspects of a substantive discipline.

Total Units for the Major62-64

B.S. Major Requirements:

(Options: **Statistics-General;**
Statistics-Computer Science)

UNITS

Preparatory Subject Matter24-31

Calculus, Mathematics 21A, 21B, 21C12
 Linear algebra; differential equations, Mathematics 22A, 22B6
 Computer science;
 General option3-4
 Computer Science Engineering 30 or
 Engineering 5 (or the equivalent)
 Computer Science option10
 Computer Science Engineering 30 and
 40 and Electrical and Computer Science
 Engineering 70

Statistics through computers, Statistics 323

Statistics—General option

Depth Subject Matter51-54

Analysis of variance, multiple regression, Statistics 106, 108 or the equivalent8
 Introduction to probability, mathematical statistics, Statistics 131A, 131B, 131C or the equivalent12
 Four Statistics courses having Statistics 131B as a prerequisite12-13
 Linear algebra, Mathematics 1673
 Three upper division Mathematics courses selected from 108, 127A-127B-127C, 128A-128B-128C, 168 (Mathematics 127 strongly recommended for students considering graduate work in Mathematics or Statistics.)10-12
 Related elective courses6
 Two upper division courses approved by major adviser. These may be in mathematics, computer science or in quantitative aspects of a substantive discipline.

Total Units for the Major75-85
(General option)

Statistics—Computer Science option

Depth Subject Matter49-53

Analysis of variance, multiple regression, Statistics 106, 108 (or the equivalent)8
 Introduction to probability, mathematical statistics, Statistics 131A, 131B, 131C12
 Two courses having Statistics 131B as a prerequisite6-7
 Statistical computing, Statistics 1413
 Operating systems and System programming, Computer Science Engineering 1504
 Data structures, Computer Science Engineering 1104
 Data base systems, Computer Science Engineering 165 or Mathematics 1603-4
 Mathematics, two courses from Mathematics 128A, 128B, 132A, 132B, 167, 1686-8
 Computer Science Engineering 122, or Computer Science Engineering 1753

Total Units for the Major73-84
(Computer Science option)**Major Adviser.** J.-L. Wang.

Students are encouraged to meet with an adviser to plan a program as early as possible. Sometime before or during the first quarter of the junior year students planning to major in Statistics should consult with a faculty adviser to plan the remainder of their undergraduate programs.

Minor Program Requirements:

The Division offers a minor program in Statistics that consists of a survey at the upper division level of the fundamentals of mathematical statistics and of the most widely used applied statistical methods.

UNITS

Statistics19-20

Statistics 106, 108, and 130A-130B or 131A-131B16

One course in Statistics having Statistics 130B or 131B as a prerequisite3-4

Preparation: Statistics 13 or 32.

Graduate Study. The Graduate Group in Statistics offers study and research leading to the M.S. and Ph.D. degrees in Statistics. Detailed information concerning these degree programs, as well as information on admissions and on financial support, is available from the Division of Statistics.

Graduate Adviser. R.H. Shumway.

Statistical Consulting. The Division provides a consulting service for researchers on campus. For more information, call the Statistical Laboratory Office (916-752-6096).

Courses in Statistics (STA)

Lower Division Courses

10. Statistical Thinking (3) III. Utts

Lecture—3 hours. Prerequisite: two years of high school algebra. Statistics and probability in daily life. Examines principles of collecting, presenting and interpreting data in order to critically assess results reported in the media; emphasis is on understanding polls, unemployment rates, health studies, etc.; understanding probability, risk and odds. General Education credit: Nature and Environment.

*12. Introduction to Discrete Probability (3) I. The Staff

Lecture—3 hours. Prerequisite: two years of high school algebra. Random experiments; countable sample spaces; elementary probability axioms; counting formulas; conditional probability; independence; Bayes theorem; expectation; gambling problems; binomial, hypergeometric, Poisson, geometric, negative binomial and multinomial models; limiting distributions; Markov chains. Applications in the social, biological, and engineering sciences. Offered in alternate years.

13. Elementary Statistics (4) I, II, III. The Staff

Lecture—4 hours. Prerequisite: two years of high school algebra. Measures of central tendency and dispersion; binomial, normal, Student-t, and chi-square distributions; testing hypotheses; nonparametric statistics; regression and correlation theory. (Students who have had courses 130A or 131A may not receive credit for Statistics 13.)

*13AT. Self-Paced Modular Instruction in Elementary Statistics (4) I, II. Wiggins

Autotutorial—4 hours. Prerequisite: two years of high school algebra, no prior knowledge of computers assumed. Computer tutorial. Corresponds to course 13. Students working at computer solve randomly chosen problems until they qualify to take examinations. Computer-timed examinations present a fixed number of problems for solution. Exams may be repeated.

32. Basic Statistical Analysis Through Computers (3) II, III. The Staff

Lecture—3 hours. Prerequisite: Mathematics 16B or 21B; ability to program in a high-level computer language such as Pascal. Overview of probability modeling and statistical inference. Problem solution through mathematical analysis and computer simulation. Recommended as alternative to course 13 for

students with some knowledge of calculus and computer programming.

90X. Seminar (1-2) I, II, III. Roussas

Seminar—1-2 hours. Prerequisite: high school algebra and consent of instructor. Examination of a special topic in a small group setting.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Applied Statistics for Biological Sciences (4) I, II, III. The Staff

Lecture—4 hours. Prerequisite: Math 16B or its equivalent. Introduction to probability computation and modeling, estimation, hypothesis testing, contingency tables, ANOVA, regression, and to implementation of statistical methods using a computer package. Students who have taken course 13 may receive only 2 units credit.

102. Introduction to Probability Modeling and Statistical Inference (4) I, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: two years high school algebra, and upper division standing. Introductory probability and statistics at a rigorous yet precalculus level. Topics include: probability models—binomial, Poisson, geometric; normal and sampling distributions; graphics; exploratory data analysis; parametric and nonparametric estimation and testing; analysis of variance; regression; computing with Minitab package. Students who have had course 13 may receive only 2 units of credit for course 102.

103. Applied Statistics for Business and Economics (4) I, II, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 13, 32, or 102; and Mathematics 16A, 16B. Descriptive statistics; probability; random variables; expectation; binomial, normal, Poisson, other univariate distributions; joint distributions; sampling distributions, central limit theorem; properties of estimators; linear combinations of random variables; testing and estimation; Minitab computing package.

***104. Applied Statistical Methods: Nonparametric Statistics (3) II.** The Staff

Lecture—3 hours. Prerequisite: course 13, 32, or 102. Sign and Wilcoxon tests, Walsh averages. Two-sample procedures. Inferences concerning scale. Kruskal-Wallis test. Measures of association. Chi square and Kolmogorov-Smirnov tests. Offered in alternate years.

106. Applied Statistical Methods: Analysis of Variance (4) I, II. The Staff

Lecture—4 hours. Prerequisite: course 13, 32, or 102. One-way and two-way fixed effects analysis of variance models. Randomized complete and incomplete block design, Latin squares. Multiple comparisons procedures. One-way random effects model.

108. Applied Statistical Methods: Regression Analysis (4) I, II, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 13, 32 or 102. Simple linear regression, variable selection techniques, stepwise regression, analysis of covariance, influence measures, computing packages.

110. Applied Statistical Methods: Multivariate Analysis (3) III. The Staff

Lecture—3 hours. Prerequisite: courses 13, 32, or 102, and 106 or 108, or the equivalent. Random vectors and matrices. Geometry and statistical distance. Multivariate normal distribution. One-sampling Hotelling's T^2 , Paired comparisons. One-way MANOVA. Principal components. Factors analysis. Canonical correlation analysis. Discriminant analysis. Cluster analysis. Emphasis on intuition, use of computer packages, and interpreting results. Offered in alternate years.

120. Probability and Random Variables for Engineers (4) I, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 21A, 21B, 21C, and 22A. Basic concepts of probability theory with applications to elec-

trical engineering, discrete and continuous random variables, conditional probability, combinatorics, bivariate distributions, transformation of random variables, law of large numbers, central limit theorem, and approximations.

130A. Mathematical Statistics: Brief Course (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16B. Basic probability, densities and distributions, mean, variance, covariance, Chebyshev's inequality, some special distributions, sampling distributions, central limit theorem and law of large numbers, point estimation, some methods of estimation, interval estimation, confidence intervals for certain quantities, computing sample sizes.

130B. Mathematical Statistics: Brief Course (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 130A. Transformed random variables, large sample properties of estimates. Basic ideas of hypotheses testing, likelihood ratio tests, goodness-of-fit tests. General linear model, least squares estimates, Gauss-Markov theorem. Analysis of variance, F-test. Regression and correlation, multiple regression. Selected topics.

131A. Introduction to Probability Theory (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 21A, 21B, 21C, and 22A. Fundamental concepts of probability theory, discrete and continuous random variables, standard distributions, moments and moment-generating functions, laws of large numbers and the central limit theorem. Students who have had Mathematics 131 may not receive credit for Statistics 131A.

131B-131C. Introduction to Mathematical Statistics (4-4) II-III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 131A, or Mathematics 22A and 131. Sampling, methods of estimation, sampling distributions, confidence intervals, testing hypotheses, linear regression, analysis of variance, elements of large sample theory, and nonparametric inference.

133. Mathematical Statistics for Economists (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 103 and Mathematics 16B, or their equivalents; no credit will be given to students majoring in Statistics. Probability, basic properties; discrete and continuous random variables (binomial, normal, t , chi-square); expectation and variance of a random variable; bivariate random variables (bivariate normal); sampling distributions; central limit theorem; estimation, maximum likelihood principle; basic of hypothesis testing (one-sample).

134. Nonparametric Inference (3) II. The Staff

Lecture—3 hours. Prerequisite: course 130B or 131B. Selected topics in nonparametric statistical inference from a one-sample and a k -sample point of view. Topics include Kolmogorov-Smirnov type tests; confidence intervals for quantiles, location and scale parameters; rank tests, dispersion tests, efficiency. Offered in alternate years.

135. Multivariate Data Analysis (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 130B, and preferably course 131B. Multivariate normal distribution; Mahalanobis distance; sampling distributions of the mean vector and covariance matrix; Hotelling's T^2 ; simultaneous inference; one-way MANOVA; discriminant analysis; principal components; canonical correlation; factor analysis. Intensive use of computer analyses and real data sets.

136. Applied Linear Models: Analysis of Variance (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 22A and any one of courses 130B, 131B, or 133. Review of linear algebra and statistics, problems in a linear model, analysis of variance, advanced topics in analysis of variance, variance components model.

137. Applied Time Series Analysis (3) III. The Staff

Lecture—3 hours. Prerequisite: course 130B or 131B or the equivalent. Auto- and cross-correlation, spec-

tral analysis, coherence, transfer relations, linear filters, seasonal adjustment, mean square regression, autoregressive moving average models, forecasting, Box-Jenkins methods, spectral analysis of variance, and signal detection and discrimination methods.

138. Analysis of Categorical Data (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 130B or 131B, or courses 106 and 108. Varieties of categorical data, cross-classifications, contingency tables, tests for independence. Multidimensional tables and log-linear models, maximum likelihood estimation; tests of goodness-of-fit. Logit models, linear logistic models. Analysis of incomplete tables. Packaged computer programs, analysis of real data.

139. Applied Linear Models: Regression Analysis (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 22A and any one of courses 130B, 131B, or 133. Simple linear regression, general linear model and examples, point estimation, tests of hypotheses, multiple regression, advanced topics in regression, analysis of covariance.

140A. Introduction to Biostatistics I (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 13 or 102 or the equivalent, and Mathematics 16A and 16B. Basic probability concepts and results; diagnostic tests; common distributions; sampling distributions and central limit theorem; likelihood methods; hypothesis testing; likelihood ratio tests, tests based on the t -distribution and the chi-square distribution.

140B. Introduction to Biostatistics II (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 140A or 130B. Observational studies; clinical trials; survival analysis; dose-response analysis.

141. Statistical Computing (3) II. The Staff

Lecture—3 hours. Prerequisite: course 130A or 131A, and one of courses 13, 32, 100, 102, or the equivalent, and experience in computer programming; course 130B or 131B recommended. Use of computers in statistics. Numerical foundations of statistical procedures. Computation of probabilities and quantiles. Random numbers. Monte Carlo method and bootstrap. Methods for parametric statistical models. Graphical methods and exploratory data analysis.

***142. Reliability (3) III.** The Staff

Lecture—3 hours. Prerequisite: course 130B or 131B or consent of instructor. Stochastic modeling and inference for reliability systems. Topics include: coherent systems, statistical failure models, notions of aging, maintenance policies and their optimization. Offered in alternate years.

***144. Sampling Theory of Surveys (3) I.** The Staff

Lecture—3 hours. Prerequisite: course 130B or 131B. Description and analysis of sample surveys with applications in the social and biological sciences. Stratified and cluster sampling. Ratio estimation. Problem of nonresponse. Offered in alternate years.

145. Bayesian Statistical Inference (3) II. The Staff

Lecture—3 hours. Prerequisite: courses 130A-130B or 131A-131B-131C or the equivalent. Subjective probability, Bayes Theorem, conjugate priors, non-informative priors, decision theory, estimation, testing, prediction, empirical Bayes methods, Bayesian robustness, properties of Bayesian procedures, comparisons with classical procedures, approximation techniques, hierarchical Bayesian analysis, applications. Offered in alternate years.

190X. Seminar (1-2) I, II, III. Roussas

Seminar—1-2 hours. Prerequisite: one of courses 13, 32, 100, 102, or 103. In-depth examination of a special topic in a small group setting.

192. Internship in Statistics (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours; term paper. Prerequisite: upper division standing and consent of instructor. Work experience in statistics. (P/NP grading only.)

*Course not offered this academic year.

194HA-194HB. Special Studies for Honors Students (4-4) I-II. The Staff (Chairperson in charge)
Independent study—12 hours. Prerequisite: senior qualifying for honors. Directed reading, research and writing, culminating in the completion of a senior honors thesis or project under direction of a faculty adviser. (Deferred grading only, pending completion of sequence.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

205. Statistical Methods for Research (3) III. The Staff
Lecture—3 hours. Prerequisite: course 106 or Agricultural Science and Management 150, or the equivalent. Topics in experimental design include: Latin squares, Youden squares, balanced and partially balanced incomplete block designs, factorial experiments, confounded designs, split-plot designs, lattice designs, fractional factorial designs, repeated measurements designs, optimal designs based on various criteria, analysis of covariance.

221. Biostatistics I (3) I. The Staff
Lecture—3 hours. Prerequisite: one of the following courses: 231A, 131B, 130B, or 133; and either course 136 and 139, or course 106 and 108. Clinical trials, cross-over design, randomization models, sequential monitoring methods, applications to clinical trials, observational studies, estimation of risks, diagnostic procedures, dose-response relations, combination of drugs, low-dose extrapolation.

222. Biostatistics II (3) II. The Staff
Lecture—3 hours. Prerequisite: course 231A, 231B, and 231C; or course 230 and consent of instructor. Parametric survival models, semiparametric survival models, applications of survival methods in epidemiology, data analysis, computer packages.

223. Biostatistics III (3) III. The Staff
Lecture—3 hours. Prerequisite: course 231A, 231B, and 231C; or course 230 and consent of instructor. Generalized linear models, longitudinal studies, stochastic models in epidemiology and medicine, advanced biostatistical topics, advanced biostatistical data analysis.

230. Brief Advanced Mathematical Statistics (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 131A, 131B, 131C, and Mathematics 167, or their equivalent. Distribution theory, modes of convergence, laws of large numbers, central limit theorem, Slutsky's Theorem, delta-method, consistency and asymptotic normality of maximum likelihood estimates, method of scoring, hypotheses testing based on likelihood ratios, Pitman efficiency, concepts of decision theory, Bayesian inference. Students who have received credit for courses 231A, 231B, or 231C may receive only 2 units, 1 unit, or no credit respectively for course 230.

231A-231B-231C. Mathematical Statistics (4-4-4) I-II-III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 131C and Mathematics 127A-127B or the equivalent. Distribution theory, decision theoretic methods, estimation and hypotheses testing, multivariate techniques, large sample theory.

232A-232B. Linear Model Theory (4-4) II-III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 131C. Estimation and testing for the general linear hypothesis, components of variance, multiple comparisons.

***233. Design of Experiments (3) II.** The Staff
Lecture—3 hours. Prerequisite: course 131C. Topics from balanced and partially balanced incomplete block designs, fractional factorials, and response surfaces. Offered in alternate years.

235A-235B-235C. Probability Theory (3-3-3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: Mathematics 127C and courses 131A-131B or the equivalent. Measure theoretic foundations, abstract integration, modes of convergence, limit theorems, independence, laws of large numbers, characteristic functions, central limit theorem, conditional expectations; topics from discrete time, Markov and stationary processes, ergodic theory, Brownian motion, weak convergence, Wiener and Poisson processes. (Same course as Mathematics 235A-235B-235C.)

***237A. Time Series Analysis: Foundations (3) I.** The Staff
Lecture—3 hours. Prerequisite: course 131A or Mathematics 131 or the equivalent. Basic structure of stationary and non-stationary time series. Differentiation, integration, spectral representations, linear filtering, mean square estimation, the discrete Fourier transform, laws of large numbers, autoregressive moving average processes. Offered in alternate years.

***237B. Time Series Analysis: Statistical Inference (3) II.** The Staff
Lecture—3 hours. Prerequisite: courses 131B-131C and 237A. Multivariate normal processes, spectral estimation, tests of hypotheses, regression, discrimination filtering, spectral analysis of variance, ARIMA processes, state space models, and maximum likelihood estimation. Offered in alternate years.

238. Theory of Multivariate Analysis (3) II. The Staff
Lecture—3 hours. Prerequisites: course 135 and 231C. Random vectors and matrices, characteristic functions; multivariate normal; multiple and canonical correlation; Cochran's Theorem; multivariate GLM; growth curves; Wishart distribution; likelihood ratio and union-intersection tests; simultaneous inference; spatial linear models; projection pursuit; Bayesian multivariate methods; Stein and shrinkage estimators. Offered in alternate years.

***240A-240B. Nonparametric Inference (3-3) II-III.** The Staff
Lecture—3 hours. Prerequisite: course 231C; courses 235A-235B-235C recommended. Comprehensive two-quarter sequence on nonparametric statistical inference, including the most basic materials from: classical nonparametrics, robustness, nonparametric estimation of a distribution function from incomplete data, curve estimation, and theory of resampling methodology. Offered in alternate years.

241. Asymptotic Theory of Statistics (3) III. The Staff
Lecture—3 hours. Prerequisite: course 231C; courses 235A, 235B, 235C recommended. Topics in asymptotic theory of statistics chosen from: weak convergence, contiguity, empirical processes, Edgeworth expansion, and semiparametric inference. Offered in alternate years.

250. Advanced Data Analysis (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 141, 232A and either course 230 or 231A. Resampling methods and one to three additional topics selected from nonparametric and semi-parametric methods, incomplete data analysis, diagnostics, non-standard multivariate and time series analysis, applied Bayesian methods, sequential analysis and quality control, categorical data analysis. Offered in alternate years.

***251. Topics in Advanced Theory of Statistics (3) II.** The Staff
Lecture—3 hours. Prerequisite: course 231C. Bayesian, regression, sequential and survival analysis; bootstrap and reliability theory; change-point problems; empirical and spatial processes; asymptotic inference under dependence; asymptotic theory in linear, parametric and semiparametric models. Offered in alternate years.

280. Orientation to Statistical Research (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. Guided orientation to original statistics research papers, and oral presentations in class of such

papers by students under the supervision of a faculty member. (S/U grading only.)

290. Seminar in Statistics (1-6) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Seminar on advanced topics in probability and statistics. (S/U grading only.)

292. Graduate Group in Statistics Seminar (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: graduate standing. Statistics seminars, mostly in applied topics, presented by members of the Graduate Group in Statistics and other guest speakers. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff
Prerequisite: candidate for Ph.D. degree. Research in statistics under the supervision of major professor. (S/U grading only.)

Professional Course

390. Methods of Teaching Statistics (2) I. The Staff (Chairperson in charge)
Lecture/discussion—2 hours, workshop—1 hour. Training in teaching methodology at the undergraduate level. Emphasis is on practical training exercises which are used to evaluate skills and improve these skills. Lecture exercises will be videotaped and critiqued. (S/U grading only.)

Professional Course

401. Methods in Statistical Consulting (3) I, II. The Staff
Lecture/discussion—3 hours; laboratory—1 hour. Prerequisite: graduate standing in Statistics. Introduction to consulting; in-class consulting as a group; individual or team consulting under supervision. (S/U grading only.)

Statistics (A Graduate Group)

George G. Roussas, Ph.D., Chairperson of the Group

Group Office, 469 Kerr Hall (916-752-2361)

Faculty. The Group has approximately 38 faculty members from all colleges, schools, and divisions, including 13 from the Intercollege Division of Statistics.

Graduate Study. The Graduate Group in Statistics offers programs of study and research leading to the M.S. and Ph.D. degrees. The M.S. is designed to give students a strong foundation in the theory of statistics as well as substantial familiarity with the most widely used statistical methods. Facility in computer programming is essential for some of the course work. The supervised statistical consulting required of all M.S. students has proven to be a valuable educational experience. The Ph.D. program combines advanced course work in statistics and probability with the opportunity for in-depth concurrent study in an applied field. The Biostatistics Affinity Group, a subgroup of the Graduate Group in Statistics, has been formed to oversee the recently approved emphasis in biostatistics in the Ph.D. program. For detailed information, see the *Graduate Announcement*, or contact the Chairperson of the Group.

Preparation. For admission to the Ph.D. program, course work requirements for the master's degree, and at least one semester/two quarters of advanced calculus must be completed.

Graduate Adviser. W.O. Johnson.

Subject A

See under University Requirements (Bachelor's Degree Requirements chapter)

Surgery

See Surgery (Medicine, School of); and Surgical and Radiological Sciences (Veterinary Medicine), below

Surgical and Radiological Sciences

(School of Veterinary Medicine)

John R. Pascoe, B.V.Sc., Ph.D., Chairperson of the Department

Department Office, 2112 Medical Science 1A
(916-752-3599)

Faculty

Cleta S. Bailey, D.V.M., Ph.D., Professor
Roy W. Bellhorn, D.V.M., M.S., Professor
Eugene M. Breznock, D.V.M., Ph.D., Professor
Susan C. Buyukmihci, V.M.D., Professor
Clare R. Gregory, D.V.M., Associate Professor
Steve C. Haskins, D.V.M., M.S., Professor
Susan V. Hildebrand, D.V.M., Professor
William J. Hornof, D.V.M., M.S., Professor
Janet E. Ilkiw, B.V.Sc., Ph.D., Associate Professor
James H. Jones, D.V.M., Ph.D., Associate Professor
Philip D. Koblik, D.V.M., M.S., Professor
Robert L. Linford, D.V.M., Ph.D., Assistant Professor
Bruce R. Madewell, V.M.D., M.S., Professor
Dennis M. Meagher, D.V.M., Ph.D., Professor
Thomas G. Nyland, D.V.M., Professor
Timothy R. O'Brien, D.V.M., Ph.D., Professor
John R. Pascoe, B.V.Sc., Ph.D., Associate Professor
Peter J. Pascoe, B.V.Sc., Assistant Professor
Jack R. Snyder, D.V.M., Ph.D., Assistant Professor
Eugene P. Steffey, V.M.D., Ph.D., Professor
Alain P. Théon, Dr. Med. Vet., Assistant Professor
Philip B. Vasseur, D.V.M., Professor

Emeriti Faculty

Robert M. Cello, D.V.M., Professor Emeritus
Marvin Goldman, Ph.D., Professor Emeritus
Ira M. Gourley, D.V.M., Ph.D., Professor Emeritus
Terrell A. Holliday, D.V.M., Ph.D., Professor Emeritus
Robert L. Leighton, V.M.D., Professor Emeritus
Joe P. Morgan, D.V.M., Vet. med. dr., Professor Emeritus
Harold R. Parker, D.V.M., Ph.D., Professor Emeritus
Gordon H. Theilen, D.V.M., Professor Emeritus
John D. Wheat, D.V.M., Professor Emeritus
Ailda P. Wind, M.V.D., Lecturer Emeritus

Clinical Faculty

David D. Canton, D.V.M., Assistant Clinical Professor
Gregory L. Ferraro, D.V.M., Associate Clinical Professor
Dennis V. Hacker, D.V.M., Assistant Clinical Professor
Larry Y. Kerr, D.V.M., Associate Clinical Professor

Jan Komtebedde, D.V.M., Assistant Clinical Professor
Gregg Kortz, D.V.M., Lecturer
Susan A. Kraegel, D.V.M., Lecturer
Michael L. Magne, D.V.M., M.S., Assistant Clinical Professor
Kyle G. Mathews, D.V.M., M.S., Lecturer
John S. Mattoon, D.V.M., Associate Clinical Professor
George M. Peavy, D.V.M., Assistant Clinical Professor
Elisabeth Richardson, D.V.M., Lecturer
Randall H. Scagliotti, D.V.M., Associate Clinical Professor
Sam Silverman, D.V.M., Ph.D., Clinical Professor
James Ticer, D.V.M., Ph.D., Associate Clinical Professor
Melinda K. Van Vechten, D.V.M., Assistant Clinical Professor
Erik R. Wisner, D.V.M., Assistant Clinical Professor
Leigh West-Hyde, D.V.M., Associate Clinical Professor

Courses in Surgical and Radiological Sciences (VSR)

Upper Division Course

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Graduate Courses

***230. Principles of Anesthesia and Surgery** (2) II. Steffey

Lecture—2 hours. Prerequisite: graduate or professional student or consent of instructor. Presentation and integration of principles and techniques of anesthesia and surgery for laboratory animals. Course is not restricted to student numbers. Offered in alternate years.

***230L. Principles of Anesthesia and Surgery** (2) II. Steffey

Laboratory—4 hours. Prerequisite: course 230 concurrently. Laboratory to complement course 230. Limited enrollment. Offered in alternate years. (S/U grading only.)

265A. Principles and Practice of Veterinary Radiation Oncology - A (1.5) II. Theon

Lecture—1 hour; laboratory—3 hours total. Prerequisite: open only to graduate students and residents. Principles and practice of veterinary radiation therapy. Topics will include a series of lectures on physical methods of radiation therapy, biologic effects of therapeutic radiation, and applications in veterinary patients. Offered in alternate years. (Same course as 465A.) (S/U grading only.)

265B. Principles and Practice of Veterinary Radiation Oncology - B (1.5) III. Theon

Lecture—1 hour. Prerequisite: course 265A. Principles and practice of veterinary radiation therapy. The topics will include a series of lectures on physical methods of radiation therapy, biologic effects of therapeutic radiation, and applications in veterinary patients. Offered in alternate years. (Same course as 465B.) (S/U grading only.)

280. Structure and Function of the Mammalian Respiratory System (4) II. Jones

Lecture—3 hours; discussion—1 hour. Prerequisite: Biochemistry 101A-101B, Mathematics 16A, 16B and 16C, Physics 5A and 5B. Advanced study of respiratory physiology and morphometry with emphasis on principles of allometry, ventilation and perfusion, gas distribution, exchange, transport, and delivery at rest, during exercise, and at high altitude. Offered in alternate years.

290. Clinical Neurology/Neuropathology Conference (1) I, II, III. Cardinet, Higgins, Bailey

Seminar—1.5 hours. Prerequisite: third- or fourth-year standing in the School of Veterinary Medicine, Veterinary Medicine Teaching Hospital, or UCDMC resident or graduate student in appropriate discipline. Discussion and review of neural and muscular pathology of selected cases from the Veterinary Medicine Teaching Hospital. (S/U grading only.)

291. Anesthesia/Critical Care Basic Science Conference (1) I, II, III. The Staff (P. Pascoe in charge)
Discussion—1 hour. Prerequisite: postdoctoral, medical, or graduate student; consent of instructor. Advanced course in scientific foundations of animal anesthesia and critical care. Format is directed by discussion following reading of assigned material emphasizing foundations in pharmacology and physiology. (S/U grading only.)

293. Anesthesia/Critical Care Case Management Conference (1) I, II, III. The Staff (P. Pascoe in charge)

Discussion—1 hour. Prerequisite: postdoctoral, medical or graduate student; consent of instructor. Discussion of Veterinary Medical Teaching Hospital case material to illustrate specific medical problems and their preventive and corrective management. (S/U grading only.)

294. Seminars in Veterinary Surgery (1) I, II, III.

Komtebedde
Seminar—1.5 hours every other week. Prerequisite: D.V.M. or equivalent degree and resident in specialty training or graduate student in related discipline. Discussion of selected topics pertaining to clinical academic veterinary surgery. Review of current principles and treatment modalities of veterinary surgery in large and small animal clinics. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Steffey in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Professional Courses

408. Special Procedures Rounds (2) I, II, III. The Staff
Discussion—6 hours. Prerequisite: a DVM degree and consent of instructor. Approved for graduate degree credit. Review of selected radiology cases from previous day. Specific radiographic changes and differential diagnosis are discussed, with participants leading the discussions. Special procedures such as angiography; nuclear medicine and ultrasound examinations are reviewed. May be repeated for credit. (S/U grading only.)

409. Known Case Conference (1.5) I, II, III. The Staff
Discussion—demonstration—1.5 hours. Prerequisite: a DVM degree and consent of the instructor. Approved for graduate degree credit. Film review of current VM Teaching Hospital proven cases. Intended for radiology residents and others with background in diagnostic radiology. May be repeated for credit. (S/U grading only.)

410. Current Topics in Radiological Sciences (1.5) I, II, III, IV. The Staff

Lecture—1.5 hours. Prerequisite: DVM degree or consent of instructor. Fundamentals of radiological sciences for radiology residents. Topics will include series of in-depth lectures covering the broad spectrum of veterinary radiology/radiological sciences and related alternate imaging modalities. Clinically oriented but also including relevant research material. (S/U grading only.)

411. Small Animal Surgery (1 1/2 per week) I, II, III. The Staff (Vasseur in charge)

Laboratory—50 hours. Prerequisite: professional standing, House Officer in Veterinary Medical Teaching Hospital, or consent of instructor. House Officers responsible for care of pet animal patients in the hospital including physical examinations, presurgical work-ups, surgery, postoperative care and follow-up under the supervision of the senior surgical staff. May be repeated for credit. (S/U grading only.)

412. Large Animal Surgery (1 1/2 per week) I, II, III. The Staff (Pascoe in charge)

Laboratory—50 hours. Prerequisite: professional standing, House Officer in Veterinary Medical Teaching Hospital, or consent of instructor. House Officers responsible for care of farm animal surgical patients in the hospital and outpatient clinic including physical examinations, presurgical work-up, assistance at operations, surgery, post-surgical care and follow-up under the supervision of the senior surgical staff. May be repeated for credit. (S/U grading only.)

413. Foundations in Veterinary Dentistry (2) III.

West-Hyde

Lecture—20 hours total. Prerequisite: second-, third-, or fourth-year Veterinary students; residents in specialty training; or graduate students. Overview of current knowledge and practical techniques used in small animal dentistry. (S/U grading only.)

414. Veterinary Anesthesiology (1 1/2 per week) I, II, III. The Staff (Steffey in charge)

Laboratory—50 hours. Prerequisite: professional standing, House Officer in Veterinary Medical Teaching Hospital, or consent of instructor. House Officers responsible for anesthetic care of patients in the operating rooms under the supervision of the senior staff. May be repeated for credit. (S/U grading only.)

415. Lameness in Dogs (1.3) III. Vasseur

Lecture—13 sessions. Prerequisite: third-year standing in the School of Veterinary Medicine. Discussion of lameness examination will be followed by detailed descriptions of the disorders that cause lameness in dogs and cats and methods to diagnose and treat them effectively. An important goal will be to distinguish those disorders that can be managed by the general practitioner from those that require referral to a specialist.

415L. Lameness in Dogs (0.5) III. Vasseur

Laboratory—3 three-hour sessions. Prerequisite: third-year standing in the School of Veterinary Medicine. Hands-on experience in surgical manipulation and exposure of joints. (S/U grading only.)

420. Small Animal Neurosurgery (1 1/2 per week) I, II, III. Bailey

Lecture—4 hours; laboratory—16 hours. Prerequisite: professional standing, House Officer in Veterinary Medical Teaching Hospital, or consent of instructor. House Officers responsible for care of hospital and outpatients including history taking, neurologic examinations and special diagnostic and therapeutic procedures under the direction of the staff neurologist. (S/U grading only.)

422. Veterinary Ophthalmology (3/4-1 1/2 per week) I, II, III. Bellhorn

Laboratory—25-50 hours. Prerequisite: professional standing, House Officer in Veterinary Medical Teaching Hospital, or consent of instructor. House Officers responsible for the care of animals in the hospital and out-patient clinic including history taking, ophthalmologic examinations, special diagnostic techniques, assistance at ophthalmologic surgery and medical and post surgical care under the direction of the staff ophthalmologist. May be repeated for credit. (S/U grading only.)

423. Small Animal Ophthalmology (2) III. Buyukmichi

Lecture—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Diagnosis and treatment of commonly encountered eye diseases of small animals and nondomestic animals.

423L. Small Companion Animal Ophthalmology Laboratory (0.3) III. Buyukmichi, Bellhorn

Laboratory—2 four-hour sessions. Prerequisite: course 422 or the equivalent and concurrent enrollment in course 423. Approved for graduate degree credit. Ocular surgical laboratory. Several surgical procedures involving the lids and conjunctiva, as well as enucleation, will be performed at each session. (S/U grading only.)

424. Case Studies in Veterinary Oncology (1) II. Madewell

Lecture—10 hours. Prerequisite: second-year student of Veterinary Medicine elective course offering. By use of clinical case material, the student will be introduced to the Internal Medicine Subspecialty of Oncology. Course will highlight clinical considerations, but will also serve to introduce basic tenets of tumor biology. (S/U grading only.)

460. Emergency and Critical Patient Care (2) III. Haskins

Lecture—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Introduction to the essential and practical concepts of care for emergency and critically ill patients.

461. Small Animal Orthopedic Surgery (2.7) II.

Vasseur

Lecture—27 sessions. Prerequisite: third-year standing in the School of Veterinary Medicine. Management of common fractures, luxations and other injuries in dogs is presented.

461L. Small Animal Orthopedic Surgery (0.5) II.

Vasseur

Laboratory—3 three-hour sessions. Prerequisite: third-year standing in the School of Veterinary Medicine. Hands-on experience in application of external coaptation and basic principles of application of different types of fixation for fractures. (S/U grading only.)

462. Radiographic and Ultrasonographic Diagnosis: Small Animal (1.7) III. Hornof

Lecture/discussion—2 hours. Prerequisite: third-year standing in the School of Veterinary Medicine. Students will be supplied with small animal radiographic and ultrasonographic case studies. Weekly discussion sections will be held to discuss assigned cases in small groups with instructors. Limited enrollment.

463. Soft Tissue Surgical Diseases (2) III. Gregory

Lecture—2 hours. Prerequisite: third-year standing in the School of Veterinary Medicine. Pathophysiology and surgical treatment of selected soft tissue diseases.

465A. Principles and Practice of Veterinary Radiation Oncology - A (1.5) II. Theon

Lecture—1 hour; laboratory—3 hours total. Prerequisite: open only to graduate students and residents. Principles and practice of veterinary radiation therapy. Topics will include a series of lectures on physical methods of radiation therapy, biologic effects of therapeutic radiation, and applications in veterinary patients. Offered in alternate years. (Same course as 265A.) (S/U grading only.)

465B. Principles and Practice of Veterinary Radiation Oncology - B (1.5) III. Theon

Lecture—1 hour. Prerequisite: course 465A. Principles and practice of veterinary radiation therapy. The topics will include a series of lectures on physical methods of radiation therapy, biologic effects of therapeutic radiation, and applications in veterinary patients. Offered in alternate years. (Same course as 265B.) (S/U grading only.)

466. Mixed-Large Animal Anesthesiology (1.5) II. Hildebrand

Lecture—15 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. Applied clinical anesthesiology for junior veterinary students. Special techniques and consideration for anesthetizing a variety of species including horses, swine, ruminants, large non-domestic species, cats and dogs. (S/U grading only.)

467. Small Animal Anesthesiology (1.5) II. Ilkiw

Lecture—15 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. Presentation of material which is basic to safe clinical administration of anesthetic drugs to small animals. Clinical applications, indications and contraindications, and methods of use of common anesthetic drugs and techniques will be discussed.

468. Equine Lameness and Radiology (4) III.

Meagher, O'Brien, Pool

Lecture—40 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Principles in the radiologic diagnosis of conditions that cause lameness in the equine will be emphasized. Methods used in large-animal radiography will be illustrated and latest technique for treating equine lameness will be discussed. Anatomy and pathology of some areas of the musculoskeletal system will also be presented.

468L. Equine Lameness and Radiology (1) III.

Meagher, O'Brien, Pool

Laboratory—10 three-hour sessions. Prerequisite: course 468 (concurrently). Priority enrollment for students in equine track; others with consent of instructor. Limited enrollment.

469. Equine Surgery (2) III. Pascoe

Lecture—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Designed to allow third-year veterinary students additional training and experience with surgical procedures in the horse.

469L. Equine Surgery Laboratory (1) III. Pascoe

Laboratory—10 three-hour sessions. Prerequisite: course 469 (concurrently). Specific surgical procedures of the horse are demonstrated and performed by students. Participants in the course work in groups of three on rotating basis. Limited enrollment.

492. Large Animal Grand Rounds (1/2) I, II, III. The Staff (Pascoe in charge)

Discussion—1 hour. Prerequisite: professional standing; House Officer in Veterinary Medical Teaching Hospital or consent of instructor. House Officers take an active part in the presentation and discussion of selected cases from the large animal and ambulatory clinics. (S/U grading only.)

Textile Science

See Fiber and Polymer Science

Textiles (A Graduate Group)

S. Haig Zeronian, Ph.D., D.Sc., Chairperson of the Group

Group Office, 129 Everson Hall (916-752-6650)

Faculty. The Group includes the faculty from the Division of Textiles and Clothing as well as from a variety of other departments representing related disciplinary fields.

Graduate Study. The Graduate Group in Textiles offers a program of study and research leading to the M.S. degree. Students in the program can emphasize either the physical or behavioral science aspects of textiles. Research areas include: structure, modification, and properties of fibers and related polymers as well as fibrous assemblies; and psychological and sociological factors relating to perception and consumption of textiles and apparel. Extensive specialized textiles research facilities are available. For detailed information regarding the program, address the Chairperson of the Group.

Graduate Adviser. S. H. Zeronian (Textiles and Clothing).

Textiles and Clothing

(College of Agricultural and Environmental Sciences)

Margaret H. Rucker, Ph.D., Chairperson of the Division

Division Office, 129 Everson Hall (916-752-6650)

Faculty

You-Lo Hsieh, Ph.D., Associate Professor
Susan B. Kaiser, Ph.D., Professor
Emory Menefee, Ph.D., Adjunct Professor
Howard L. Needles, Ph.D., Professor
Ning Pan, Ph.D., Assistant Professor
Margaret H. Rucker, Ph.D., Professor
S. Haig Zeronian, Ph.D., D.Sc., Professor

Emeriti Faculty

Mary Ann Morris, Ph.D., Professor Emeritus

The Major Program

The textiles and clothing major emphasizes the connections among (a) the physical characteristics of textile products, (b) human perceptions of and behavior toward these products, and (c) global economic trends affecting the textile/apparel marketplace. An integrative knowledge base links textile products with people and processes, to focus on the production, distribution, and consumer use of textiles and apparel. (See also Fiber and Polymer Science.)

The Program. The textiles and clothing major offers two options: multidisciplinary and marketing/economics. The *Multidisciplinary* option provides students with a broad knowledge base in both the social and physical sciences. This base includes production, end-use applications and care of textiles and apparel, physical and chemical properties of textiles, and social-psychological and economic aspects of textiles and clothing. The *Marketing/Economics* option emphasizes social science and business course work, while also providing students with an awareness of the physical nature of textile products.

Internships and Career Alternatives. Textiles and clothing majors can pursue internships and careers in apparel production and merchandising, retail management, international marketing, textile testing and conservation, and textiles journalism. The majority of textiles and clothing graduates accept entry-level management positions within the textile and apparel industry or in related fields, (e.g., merchandising and marketing, production, research and development, technical service and design). Students may also pursue graduate studies in textiles, business, and other areas depending on their specific selections of restricted elective coursework.

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable.) *Courses shown without parentheses are required.*

UNITS

English Composition Requirement	4-12
See College Requirement.....	0-8
Rhetoric 1.....	4
Preparatory Subject Matter	39-41
Computer science (Agricultural Systems and Environment 21, Computer Science Engineering 10).....	3-4
Economic principles (Economics 1A-1B).....	10
History of art or cultural anthropology (Anthropology 2, Art 10H).....	4
Physics (Physics 10 or Physics 1A).....	3-4
Psychology (Psychology 1).....	4
Sociology (Sociology 2).....	4
Statistics (Statistics 13).....	4
Textiles and Clothing (Textiles and Clothing 6, 8).....	8
Option-Specific Preparatory Subject Matter	16-18
Marketing/Economics Option	18
Accounting (Management 11A-11B).....	8
Chemistry (Chemistry 10).....	4
Mathematics (Mathematics 16A-16B).....	6
OR	
Multidisciplinary Option	16
Chemistry (Chemistry 2A, 2B, 8A, 8B).....	16
Breadth/General Education	6-24
Satisfaction of General Education requirement	
Marketing/Economics Option Depth Subject Matter	57-58
Agricultural economics (Agricultural Economics 100A-100B, 106, 136).....	16
Statistics (Statistics 103).....	4
Psychology or Consumer Science (Psychology 145 or 183, or Consumer Science 100).....	3-4

Textiles and clothing (Fiber and Polymer Science 110, Textiles and Clothing 107, 162, 162L, 163, 163L, 164, 165, 171, 173, 174, 177).....

Multidisciplinary Option Depth Subject Matter.....52-53

Agricultural Economics (Agricultural Economics 112, 113).....8
 Design (Design 143).....4
 Psychology or Consumer Science (Psychology 145 or 183, or Consumer Science 100).....3-4
 Textiles and clothing (Fiber and Polymer Science 100, 161, 161L, Textiles and Clothing 107, 162, 162L, 163, 163L, 164, 165, 171, 173, 174, 177).....37

Marketing/Economics Option Restricted Electives.....12

Courses selected from the following:
 Agricultural Economics 18, 112, 141M, 142, 155, 157, 171A, 171B, Anthropology 122, 126, Consumer Science 100, Design 77A, 77B, 143, Economics 101, 121A, 121B, 134, 162, and other relevant course work, Foreign language units may be used to satisfy any or all of the required 12 units, Mathematics 16C, Psychology 145, 183, Sociology 123, 126, 140, 141, 145, Textiles and Clothing 180A, 180B, 230, 293, with consent of instructor, and a maximum of 5 units in either Textiles and Clothing 192 or 199.

Multidisciplinary Option Restricted Electives.....16

Courses selected from the following:
 Agricultural Economics 18, 141, 141M, 142, 155, 171A, 171B, Agricultural Systems and Environment 120, Applied Behavioral Sciences 162, Chemistry 1C, 128A, 128B, 128C, Consumer Science 100, Design 77A, 77B, 142A, 142B, 160A, 160B, 160C, 170A, 170B, 170C, Economics 11A, 11B, 100, 101, 121A, 121B, 134, Fiber and Polymer Science 110, Foreign Language units may be used to satisfy any or all of the required 16 units, Mathematics 16A, 16B, 16C, Psychology 145, 183, Rhetoric and Communication 42, 130, 136, 140, Sociology 25, 123, 126, 140, 148, 159, 175, Statistics 106, 108; Textiles and Clothing 180A, 180B, 230, 293, with consent of instructor, and a maximum of 5 units in either Textiles and Clothing 192 or 199.

Marketing/Economics Option Unrestricted Electives.....15-44

Multidisciplinary Option Unrestricted Electives.....17-46

Total Units for the Degree.....180

Major Adviser. H.L. Needles.

Advising Center for the major is located in 129 Everson Hall (916-752-4417).

The Minor Program:

The Division of Textiles and Clothing offers a minor program for non-majors interested in satisfying secondary career objectives. For acceptance into the program see the staff adviser in 129 Everson Hall.

UNITS

Textiles and Clothing.....18
 One course from Textiles and Clothing 6, 8.....4
 Courses selected from Fiber and Polymer Science 100, 110, 161, 161L, Textiles and Clothing 107, 162-162L, 163-163L, 164, 165, 171, 173, 174, 177.....14

Minor Adviser. H.L. Needles.

Courses in Textiles and Clothing (TXC)

Questions pertaining to the following courses should be directed to the instructor or to the Division of Textiles and Clothing. See also courses in Fiber and Polymer Science.

Lower Division Courses

6. Introduction to Textiles (4) II. Needles
 Lecture—3 hours; laboratory—3 hours. Introduction to the structure and properties of textiles. Consumer use and fabric characteristics are emphasized.

8. The Textile and Apparel Industries (4) I. Rucker
 Lecture—4 hours. Study of the textile and apparel industries including fashion theory, production, distribution, and consumption of textile goods.

92. Internship in Textiles and Clothing (1-12) I, II, III. The Staff (Rucker in charge)
 Internship—3-36 hours. Prerequisite: consent of instructor. Work experience off campus in a textiles or clothing-related area. Supervision by a member of the Textiles and Clothing faculty. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Rucker in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Rucker in charge)
 (P/NP grading only.)

Upper Division Courses

107. Social and Psychological Aspects of Clothing (4) II.

Kaiser
 Lecture—3 hours; discussion—1 hour. Prerequisite: Sociology 2. Social and cognitive factors influencing management and perception of personal appearance in everyday life. Concepts and methods appropriate to the study of meaning of clothes in social and cultural contexts. General Education credit: Contemporary Societies.

162. Textile Fabrics (3) III. Pan
 Lecture—3 hours. Prerequisite: course 6. Properties of fabrics as related to serviceability, comfort, and appearance.

162L. Textile Fabrics Laboratory (1) III. Pan
 Laboratory—3 hours. Prerequisite: course 162 (may be taken concurrently). Laboratory methods and procedures employed in studying properties of textile fabrics as related to serviceability, comfort, and appearance.

163. Textile Coloration and Finishing (3) III. Needles

Lecture—3 hours. Prerequisite: course 6, Fiber and Polymer Science 110, or Chemistry 8B. Basic principles of textile dyeing, printing, and finishing; color theory; structure, properties, and application of dyes and finishes; factors affecting application and fastness; maintenance of dyed and finished textiles.

163L. Textile Coloration and Finishing Laboratory (1) III. Needles

Laboratory—3 hours. Prerequisite: course 163 (may be taken concurrently). Demonstrates various aspects of dyeing, printing, and finishing of textile substrates including the effect of fiber and finish type, and physical and chemical variables on dyeing and finishing processes and on the properties of the resultant textile.

164. Principles of Apparel Production (3) III. Hsieh
 Lecture—3 hours. Prerequisite: course 6 or 8. Overview of characteristics, technology, processes, and research in apparel manufacturing industries including study of government statistics, material utilization and fabrication, mechanization, management, and production engineering.

***165. Textile Processes (3) I.** Pan
 Lecture/discussion—3 hours. Prerequisite: course 6. Physical processes involved in the production of textiles from the individual fiber to the finished fabric. Includes spinning, texturing, yarn formation, weaving preparation, weaving and knitting, tufting and fabric finishing.

171. Clothing Materials Science (4) I. Hsieh, Pan
Lecture—3 hours; laboratory/discussion—3 hours.
Prerequisite: course 6, 8, and senior standing. The
properties, characterization, and performance eval-
uation of clothing materials and structures for specific
functional applications. Principles and methods
related to wetting and transport properties, fabric
hand and aesthetic properties, clothing comfort, and
material and assembly technology.

173. Principles of Fashion Marketing (3) II. Rucker
Lecture—3 hours. Prerequisite: course 8, Economics
1A, Agricultural Economics 113 or 136. Study of basic
elements of fashion marketing including philosophy
and objectives, organization merchandising, pricing,
promotion and personnel. Offered in alternate years.

***174. Introduction to World Trade in Textiles and
Clothing** (2) II. Rucker

Lecture—2 hours. Prerequisite: course 8. Structure of
the global fiber/textile/apparel complex and its distri-
bution patterns with an overview of political, eco-
nomic, and technological factors that are changing
these industries and their markets. Offered in alternate
years.

177. Clothing and Social Perception (3) I. Kaiser
Lecture—3 hours. Prerequisite: course 107; Sociology
2; Psychology 1. Social and cognitive processes
related to the meanings people assign to clothing
cues when perceiving one another. Particular atten-
tion to the following appearance-related stereotypes:
age, sex, physical attractiveness, status, ethnicity.
Influences of clothing and appearance on social inter-
actions.

180A-180B. Introduction to Research in Textiles
(2-2) I, II, III. The Staff (Rucker in charge)

Laboratory—6 hours. Prerequisite: senior standing
with textile-related major, and consent of instructor.
Senior thesis on independent problems. Research
begun in course 180A will be continued and com-
pleted in course 180B. (Deferred grading only, pend-
ing completion of sequence.)

192. Internship in Textiles and Clothing (1-12) I, II,
III. The Staff (Rucker in charge)

Internship—3-36 hours. Prerequisite: consent of
instructor. Work experience off campus in a textiles
or clothing-related area. Supervision by a member of
the Textiles and Clothing faculty. (P/NP grading only.)

197T. Tutoring in Textiles and Clothing (1-5) I, II,
III. The Staff (Rucker in charge)

Discussion-laboratory—3-15 hours. Prerequisite:
upper division textiles-related major and consent of
instructor. Tutoring of students in Textiles and Cloth-
ing courses. Assistance with discussion groups and
laboratory sections under supervision of instructor.
May be repeated for credit if tutoring another textiles
course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff
(Rucker in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates
(1-5) I, II, III. The Staff (Rucker in charge)
(P/NP grading only.)

Graduate Courses

230. Behavioral Science Concepts in Textiles (3)
III. Kaiser

Lecture—3 hours. Prerequisite: course 107, upper
division or graduate course in statistics (e.g., Agricul-
tural Systems and Environment 120) and one in a
behavioral science (e.g., Psychology 145). Examina-
tion of theories and research concerning relationships
between clothing and human behavior with empha-
sis on research techniques, including methods of
measuring clothing variables. Offered in alternate
years.

**250A-F. Special Topics in Polymer and Fiber Sci-
ence** (3) II. Zeronian

Lecture—3 hours. Prerequisite: Fiber and Polymer
Science 100 or consent of instructor. Selected topics
of current interest in polymer and fiber science. Top-
ics will vary each time the course is offered. (Same
course as Materials Science and Engineering
250A-F).

290. Seminar (1) I, II. The Staff

Seminar—1 hour. Critical review of selected topics of
current interest in textiles. (S/U grading only.)

290C. Research Conference (1) I, II, III. The Staff
(Rucker in charge)

Discussion—1 hour. Prerequisite: graduate standing;
consent of instructor. Individual faculty members meet
with their graduate students. Critical presentations of
original research are made by graduate students.
Research activities are planned. Discussions are led
by major professors for their research groups. (S/U
grading only.)

293. Recent Advances in Textiles (3) I. The Staff
(Zeronian in charge)

Lecture—3 hours. Prerequisite: two upper division
courses in Textiles and Clothing or consent of instruc-
tor. Critical reading and evaluation on selected top-
ics of current interest in textiles. Multidisciplinary
aspects of the topics selected will be stressed. May
be repeated for credit.

298. Group Study (1-5) I, II, III. The Staff (Rucker in
charge)

299. Research (1-12) I, II, III. The Staff (Rucker in
charge)

(S/U grading only.)

UC Davis Washington Center

Prof. Bruce W. Jentleson, Director

UC Davis Washington Center, 2301 M Street, NW,
5th Floor, Washington, D.C. 20037 (202-296-
8221)

Information:

UC Davis Washington Center
Internship and Career Center
2nd Floor, South Hall, 916-752-7260

The UC Davis Washington Center began operations in
the 1990-91 academic year. Its central objective is to
provide students and faculty new and expanded
opportunities to enrich their education and research.
Its principal activities are an undergraduate acade-
mic-internship program and a research program for
faculty and graduate students.

Undergraduate Academic Internship Program

The UC Davis Washington Center undergraduate pro-
gram is open to students from all majors in the Col-
leges of Letters and Science, Agricultural and
Environmental Sciences, and Engineering who have
completed 84 units towards graduation. Students
earn 12-16 units of academic credit, continue to be
registered as full-time students, and fulfill university
residency requirements. A GPA of approximately 3.0
is recommended for admission. Applicants also are
evaluated based on a written statement, letters of rec-
ommendation and personal interviews.

The undergraduate program runs fall and spring
quarters, on a 12-13 week "extended quarter" basis. It
has two principal components:

- **Internships/Research Projects (6-8 units):**
Students work three to four days per week as
interns in Congress, federal agencies, interest
groups, trade associations, research institutions,
the media, museums or in other organizations
related to policy, politics, science and culture and
geared to the interests and objectives of
individual students. Drawing on the internship
experience, each student will develop an
independent research project, under the
supervision of a member of the faculty.
- **Policy-Process Seminar (4 units):** Each student
must enroll in one or two upper division seminars.
Most of these courses focus on a particular area
of policy (e.g., foreign policy, science policy,
economic policy, agricultural policy) and the key

issues, the politics, the principal institutions, and
the dynamics of the process within that policy
area. Some are of more general interest, de-
signed to draw on some of the unique historical,
scientific, cultural and artistic resources of
Washington. In addition to regular instruction,
seminars are likely to include guest speakers,
observations of congressional committees and
federal agencies, and other relevant Washington
experiences.

Courses are taught by UC Davis faculty in residence,
faculty from the UCLA and UC Santa Barbara Wash-
ington programs, or visiting faculty from the Wash-
ington area.

Financial aid eligibility is maintained, and the aid
package can be adjusted to reflect the additional
costs of the Program. Some additional financial
awards also are offered directly by the Washington
Center, including the University of California Presi-
dent's Washington Scholarship Program.

Students live in university-arranged housing, conve-
nient to public transportation. Arrangements also are
made to cover health services and other aspects of
student life. The program also includes many educa-
tional, cultural and historical activities in the Wash-
ington area.

Students also may participate in a **Summer Program**.
The Summer Program is non-credit. It includes inter-
ships and many of the same educational, cultural, his-
torical and social activities but no courses or research
projects. The program fee is \$200. Some financial
assistance is provided but more limited than for the
academic year programs.

The Washington Center also has two positions for
graduate students as Graduate Fellows (combination
of a predoctoral research fellowship and a teaching
assistantship). More information is available from the
Washington Center or Graduate Studies.

Urology

See Medicine, School of

Vegetable Crops

(College of Agricultural and Environmental Sciences)

Kent J. Bradford, Ph.D., Chairperson of the
Department

Department Office, 148 Asmundson Hall (916-752-
0516)

Faculty

M. Joseph Ahrens, Ph.D., Lecturer
Alan B. Bennett, Ph.D., Professor
Arnold J. Bloom, Ph.D., Professor
Kent J. Bradford, Ph.D., Professor
Marita Cantwell, Ph.D., Lecturer
Louise E. Jackson, Ph.D., Associate Professor
Richard A. Jones, Ph.D., Professor
Richard W. Michelmore, Ph.D., Professor
Donald J. Nevins, Ph.D., Professor
Carlos F. Quiros, Ph.D., Professor
Vincent Rubatzky, Ph.D., Lecturer
Dina St. Clair, Ph.D., Assistant Professor
Mikal E. Saltveit, Jr., Ph.D., Professor
Carol Shennan, Ph.D., Associate Professor
Ronald E. Voss, Ph.D., Lecturer
Shang Fa Yang, Ph.D., Professor
John I. Yoder, Ph.D., Associate Professor

Emeriti Faculty

James F. Harrington, Ph.D., Professor Emeritus
James M. Lyons, Ph.D., Professor Emeritus
Leonard L. Morris, Ph.D., Professor Emeritus

Harlan K. Pratt, Ph.D., Professor Emeritus
 Lawrence Rappaport, Ph.D., Professor Emeritus
 Charles M. Rick, Ph.D., Professor Emeritus
 Paul G. Smith, Ph.D., Professor Emeritus
 Arthur R. Spurr, Ph.D., Professor Emeritus
 Herman Timm, Lecturer Emeritus
 James E. Welch, Ph.D., Lecturer Emeritus
 Masatoshi Yamaguchi, Ph.D., Professor Emeritus

Graduate Study. A program of study is offered leading to the M.S. degree in Vegetable Crops. Information can be obtained from the graduate adviser. Also see the Graduate Studies section in this catalog.

Graduate Adviser. H. Timm.

Related Courses. Vegetable Crops faculty also teach the following courses that contribute to majors and graduate programs in Agricultural Systems and Environment, Biological Sciences, Genetics, and Plant Biology:

Agricultural Systems and Environment 2, 22, 100, 118, 150, 195, Biological Sciences 1C, Genetics Graduate Group 201D, 202, 207L, Plant Biology 201, 208, 214, 217, 218A, 228, Plant Science 1, 10, 112, 112L, 113, 114, 221B, 291.

Concordance

The following courses in Vegetable Crops have been transferred to other subject areas.

Former Course Number	Equivalent new course and number
101	Agricultural Systems and Environment 100 (Principles of Vegetable Crops Production)
105	Plant Science 114 (Biology, Evolution and Systematics in Vegetables)
118	Agricultural Systems and Environment 118 (Seed Production and Quality)
191	Plant Science 191 (Undergraduate Research: Proposal)
191L	Plant Science 191L (Undergraduate Research: Experiment)
194H	Plant Science 194H (Senior Honors Thesis)
195	Agricultural Systems and Environment 195 (Field Study of Vegetable Industry)

Courses in Vegetable Crops (VCR)

Questions pertaining to the following courses should be directed to the instructor or to the Vegetable Crops Office, 148 Asmundson Hall.

Lower Division Course

92. Internship in Vegetable Crops (1-6) I, II, III. The Staff (Department Chairperson in charge)
 Internship—3-36 hours. Work experience off or on campus in all subject areas pertaining to vegetable crops. Internships supervised by a member of the faculty. Maximum of 12 units permitted in the Vegetable Crops 92-192 series. (P/NP grading only.)

Upper Division Courses

190. Topics in Plant Science Research (1) I, II. The Staff
 Discussion—1 hour. Prerequisite: undergraduate standing in the plant or biological sciences. Discussion and critique of current research by faculty, graduate students, and undergraduate students. May be repeated for a maximum of 3 units. (P/NP grading only.)

192. Internship in Vegetable Crops (1-12) I, II, III. The Staff (Chairperson in charge)
 Internship—3-36 hours. Prerequisite: consent of instructor. Work experience off or on campus in all subject areas pertaining to vegetable crops. Internships supervised by a member of the faculty. Maximum of 12 units permitted in the Vegetable Crops 92-192 series. (P/NP grading only.)

197T. Tutoring in Vegetable Crops (1-3) I, II, III. The Staff (Chairperson in charge)
 Laboratory/discussion—3-9 hours. Prerequisite: consent of instructor. Voluntary tutoring for upper divi-

sion students who desire teaching experience. Under supervision students may prepare laboratory materials, experiments, and autotutorial modules, conduct discussions and demonstrations, and be involved in testing. May be repeated up to a total of 6 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

201. Management of Vegetable Production Systems (3) II. Jackson
 Lecture/discussion—3 hours. Prerequisite: course 101 or consent of instructor. Overview of management practices utilized in vegetable production systems, emphasizing the balance between resource inputs and crop productivity. Topics include management of water, nutrients and energy, pest control strategies and comparative analysis of contemporary systems for fresh market and processing production.

212. Postharvest Physiology of Vegetables (4) III. Saltveit and Yang
 Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 112 or Plant Science 112. Comparative physiology of harvested vegetables; emphasis on maturation, senescence, compositional changes, physiological disorders and effects of environmental factors. Laboratories stress concepts and research procedures. Offered in alternate years.

220. Biotechnology and Genetics of Crop Improvement (3) II. Michelmore
 Lecture—3 hours. Prerequisite: Genetics 100, Plant Science 113; Genetics 102A, 102B recommended. Emphasizes the integration of modern biotechnology and classical plant breeding including: transposable elements, genetic mapping, gene identification, transformation, tissue culture, incompatibility mechanisms, male sterility, gametophyte selection, disease and stress resistance.

220L. Biotechnology and Genetics of Crop Improvement Laboratory (1) II. Michelmore
 Laboratory—3 hours. Prerequisite: course 220 concurrently. Several class projects in plant genetics and biotechnology: tomato genetics, isozyme segregation, *Agrobacterium* mediated plant transformation, self-incompatibility in *Brassica* species, mapping disease resistance genes.

221. Genetics and Cytogenetics of Vegetable Crops (3) III. Quiros
 Lecture—3 hours. Prerequisite: Plant Science 113 or the equivalent. Genetics and cytogenetics of the principal vegetables on a crop by crop basis. Current advances on the cytogenetic technology, sources of germplasm and applications to practical breeding problems.

221L. Genetics and Cytogenetics of Vegetable Crops Laboratory (2) III. Quiros
 Laboratory—6 hours. Prerequisite: course 221 (may be taken concurrently). Genetic and cytogenetic techniques applicable to vegetables. Includes chromosome squash preparations for pachytene analysis, segregation and linkage analysis of quantitative traits in interspecific hybrids, gene-centromere mapping, and aneuploid segregations.

225. Transposable Elements in Higher Plants (3) II. Yoder
 Lecture—1 1/2 hours; discussion—1 1/2 hours. Prerequisite: graduate standing or consent of instructor. Examines both the classical and molecular genetic information about plant transposable elements. Topics include the discovery, molecular structure, evolutionary significance and practical uses of these fascinating genetic entities. Offered in alternate years.

228. Plant Molecular Biology Laboratory (5) II. Bennett, Harada (Botany)
 Lecture—2 hours; laboratory—10 hours. Prerequisite: Molecular and Cellular Biology 120L, a course in molecular genetics, and consent of instructors. Research methods in plant molecular biology. Topics include

analysis of gene expression, characterization of gene structure, and gene transfer technology. Emphasis will be placed on analysis of developmentally regulated gene expression. (Same course as Plant Biology 228.)

***230. Selected Methods in Vegetable Research** (3) II. Bennett
 Lecture—1 hour; laboratory—6 hours. Prerequisite: one course from Plant Science 102, Botany 111, 112, Biochemistry 101A-101B or 101L. Survey of the theory and practice of certain laboratory methods and techniques used in vegetable/plant research, with emphasis on determination of plant constituents, physiological functions, and cell/tissue culture. Offered in alternate years.

290. Seminar (1) I, II, III. The Staff
 Discussion—1 hour. (S/U grading only.)

291. Special Topics in Vegetable Crops (2) I. The Staff (Chairperson in charge)
 Lecture—1 hour; discussion—1 hour. Prerequisite: graduate standing. In-depth coverage of selected topics in vegetable crops and related disciplines. Topics and speakers determined by instructor in charge. Assignments include brief evaluation of a lecture, and pertinent narrative or grant proposal. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
 (S/U grading only.)

Professional Course

300. Tutoring in Vegetable Crops (1-3) I, II, III. The Staff (Chairperson in charge)
 Tutoring—3-9 hours. Prerequisite: consent of instructor. Voluntary tutoring for graduate students who desire teaching experience, but who are not teaching assistants. Students under supervision may give lectures, prepare laboratory materials, experiments, and autotutorial modules, conduct discussions and demonstrations, and be involved in testing. May be repeated for a total of 6 units. (S/U grading only.)

Veterinary Medicine, School of

- Frederick A. Murphy, D.V.M., Ph.D., Dean of the School
 - George H. Cardinet III, D.V.M., Ph.D., Associate Dean—Academic Programs
 - Bennie I. Osburn, D.V.M., Ph.D., Associate Dean—Research
 - Robert J. Hansen, Ph.D., Associate Dean—Student Programs
 - Charles A. Hjerpe, D.V.M., Associate Dean—Clinical Programs; Director, Veterinary Medical Teaching Hospital
 - Donald J. Klingborg, D.V.M., Assistant Dean—Public Programs; Director, Veterinary Extension
 - Thomas B. Farver, Ph.D., Director, Master's of Preventive Veterinary Medicine Program
- School Office, 1018 Haring Hall (916-752-1360)

Courses in Veterinary Medicine (VMD)

Lower Division Course

92. Internship in Veterinary Science (1-12) I, II, III, summer. Cardinet
 Discussion-laboratory—1-4 hours; clinical experience—3-36 hours. Prerequisite: approval of project by faculty sponsor prior to period of internship. Students in this program will be under the supervision of faculty in the School of Veterinary Medicine whose

*Course not offered this academic year.

expertise is appropriate for the proposed project. (P/NP grading only.)

Upper Division Courses

170. Ethics of Animal Use (3) III. Brooks, Dundon, Price

Lecture—3 hours. Prerequisite: one basic course in composition or speech. Applied ethical methodology, respectful of divergent views, for forming personal and professional ethics toward animals. Examination of current ethical codes, case histories and problem areas and pursuit of consensus policy to protect animal and related human values. General Education credit: Civilization and Culture or Contemporary Societies.

192. Internship in Veterinary Science (1-12) I, II, III, IV. Cardinet

Discussion-laboratory and clinic—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in Veterinary Medicine. (P/NP grading only.)

Professional Courses

400. Informatics (1.0) I. Cardinet

Discussion—2 hours; laboratory—8 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Acquisition of elementary skills and proficiency in the use of microcomputing will be achieved through the "real time" use of microcomputers within the science laboratories of instruction. (S/U grading only.)

401A-401B. Microscopic and Gross Veterinary Anatomy (7.5-2.9) I-II. Hyde

Lecture—40 sessions/14 sessions (401A/401B); laboratory—35 sessions/15 sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Normal interrelationships of structure and function through an integrated presentation of molecular, cellular, tissue, organ, and whole animal structure; principles of developmental biology and organogenesis, and comparative structure of animals and their organ systems.

402A. Systemic Physiology: Cardiovascular System (1.9) I. Jones

Lecture—14 hours; laboratory—5 three-hour sessions. Prerequisite: first-year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Basic principles of normal physiologic function of the cardiovascular system. Principles are essential for understanding disorders of the cardiovascular system.

402B. Systemic Physiology: Gastrointestinal System (1.3) II. Curry

Lecture—11 hours; laboratory—2 three-hour sessions. Prerequisite: first-year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Basic principles of normal physiologic function of the vertebrate gastrointestinal system. Principles are essential for understanding disorders of the gastrointestinal system.

402C. Systemic Physiology: Respiratory System (1.8) II. Jones

Lecture—12 hours; laboratory—6 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Provides a basic understanding of normal physiological function of the vertebrate respiratory system.

402D. Physiology of the Urinary System (1.7) III. Bruss

Lecture—13 sessions; laboratory—4 sessions. Prerequisite: first year standing in the School of Veterinary Medicine. This course provides an understanding of the various function of the kidney and the urinary system; body fluids and acid-base physiology and mammary physiology.

403A-403B. Physiological Chemistry (4.6-2.0) I-II. Hansen

Lecture—36 sessions/15 sessions (403A/403B); discussion—4 sessions/2 sessions; laboratory—6 sessions/3 sessions. Prerequisite: first year standing in

the School of Veterinary Medicine. Approved for graduate degree credit. Emphasizes biochemical concepts used to analyze problems and evaluate metabolic relationships important in animal health and disease.

404A. Small Animal Radiology (1.9) II-III. Nyland

Lecture—15 hours; laboratory—4 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Introduction to interpretation of alternate imaging procedures and therapeutic radiology of small animals. (Deferred grading pending completion of sequence.)

405. Veterinary Parasitology (3.6) III. Conrad, Boyce

Lecture—26 hours; laboratory—10 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Provides an understanding of the important biological and clinical aspects of parasites and the disease they cause in animals.

406. Principles of Behavior (0.7) I. Hart

Lecture—7 hours. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Overview of animal behavior with relevance to veterinary medicine.

***407A. Principles of Operative Surgery** (0.8) III. Breznock

Lecture—7 hours; laboratory—1 three-hour session. Prerequisite: second-year standing in the School of Veterinary Medicine. Principles of operative surgery, including such topics as asepsis, sepsis, instrumentation, hemostasis, wound healing, and others.

407B. Principles and Techniques of Surgery (2) I. Pascoe

Lecture—9 hours; laboratory—9 three-hour sessions; discussion—3 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine. Continuation of course 407A. Introduces the veterinary student to technical aspects of surgical science. Specific operative procedures performed by the student provide opportunity to learn fundamental skills of asepsis, instrument identification and manipulation, knot tying, hemostasis and tissue dissection.

407C. Surgical Anatomy (1) I. Stover

Laboratory—10 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Study of anatomical topics as applied to selected surgical operations. Topographical features useful to approaching organs and structures described. Tissues and structures basic to surgery emphasized.

408. Nutrition and Nutritional Diseases in Animals (2.9) II. Morris

Lecture—27 hours; laboratory—2 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Principles of nutrition and their application to the solution of nutritional disorders of animals.

409. Epidemiology (1.7) III. Hird

Lecture—11 hours; discussion—6 hours. Prerequisite: first-year standing in School of Veterinary Medicine. Approved for graduate degree credit. Introduction to epidemiology and its applications in veterinary medicine.

414A. Principles of Veterinary Pharmacology and Toxicology (2.4) I. Joy

Lecture—22 hours; laboratory—2 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Provides a basic foundation for understanding of pharmacology and toxicology. Introduces principles of pharmacology and begins a consideration of drugs by pharmacological class.

414B. Veterinary Pharmacology (1.8) II. Giri

Lecture—17 hours; laboratory—1 three-hour session. Prerequisite: second year standing in the School of Veterinary Medicine. Presents discussion of the pharmacology of several classes of drugs which are of major importance in veterinary medicine.

414C. Veterinary Toxicology (2.1) III. Segall

Lecture—21 hours. Prerequisite: second year standing in the School of Veterinary Medicine. General principles of toxicology, mechanisms of carcinogens, teratogens, and genetic and immunotoxicants. Course also discusses the biological effects of toxic substances of biological and industrial origins in animals.

419. Virology (2.7) I. Zee, Yilma

Lecture—19 hours; laboratory—8 three-hour sessions. Prerequisite: second-year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Introduction to the classification, morphology, and the strategy of replication of animal viruses, covering the molecular pathogenesis of animal viruses at the cellular level with emphasis on agents of infectious diseases of animals.

420. Immunology (3.0) III. Gershwin

Lecture—20 hours; laboratory—10 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Concepts of immunology. Emphasis is on the principles of vaccination, responses to pathogenic agents, and the development of hypersensitivity and autoimmune reactions.

421. Principles of Neurosciences (2.7) II. Gietzen

Lecture—22 hours; laboratory—5 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. An integrated study of normal neurobiology, neuroanatomy, and neurophysiology, to enable students to engage in studies of neurologic disorders and clinical neurology.

422. Veterinary Ophthalmology (1.4) II. Bellhorn

Lecture—12 sessions; laboratory—2 sessions. Prerequisite: third-year standing in the School of Veterinary Medicine. Basic information on how the eye is examined; how it interacts with the rest of the body and what can go wrong with the eye. Discussion of selected ocular diseases of various species.

***425. Introduction to the Abnormal Musculoskeletal System** (3) III. Pool

Lecture—24 hours; laboratory—6 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Introduction to the principles of orthopedic diseases of animals, including etiology and pathogenesis, basic responses of musculoskeletal tissues to major types of injuries and diseases.

426. Principles of Veterinary Anesthesiology and Critical Patient Care (1.7) III. Steffy

Lecture—15 hours; laboratory—2 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Offers basic principles of veterinary anesthesiology including techniques monitoring and management of animals under anesthesia.

430. Principles of Radiology and Radiographic Anatomy (3.3) I-II-III. Koblik

Lecture—25 sessions, laboratory—6 sessions, discussion—2 sessions (total for series). Prerequisite: first year standing in the School of Veterinary medicine. Physical principles of x-ray production and x-ray matter interactions as they pertain to diagnostic medical imaging and radiation safety. Practical aspects of veterinary radiographic techniques. Normal radiographic anatomy of the skeleton, head, thorax and abdomen. (Deferred grading only, pending completion of three-quarter sequence.)

431. Endocrinology and Metabolism (2.0) III. Curry

Lecture—20 hours. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Provides a basic understanding of principles of the normal physiological function of the endocrine glands, their hormones, and other factors that affect the regulation of metabolic processes.

433. Veterinary Oncology (1) II. Madewell

Lecture—10 hours. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Provides veterinary students with a background to define the relationships between pathology, hematology, cytology, immunology, and the clinical manifestations of neoplastic diseases in animals.

435A-435B. Clinical Hematology and Biochemistry (4.0-2.5) I. Zinkl

Lecture—26 sessions/16 sessions (435A/435B); laboratory—14 sessions/5 sessions; discussion—4 sessions (435B only). Prerequisite: second-year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Knowledge and understanding of normal form and function of the hemolymphatic, exfoliative cytologic, and clinical biochemical systems provide critical information which aids veterinarians in assessing physical status and in understanding the etiopathogenesis of disease.

436. Veterinary Public Health and Food Safety (2.4) III. Genigeorgis

Lecture—24 sessions. Prerequisite: third year standing in the School of Veterinary Medicine. Introduction to the prevention and spread of zoonoses, protecting the consumer from disease problems associated with consumption of foods of animal origin and advising the public on public health issues having to do with their profession and animals.

437A. Issues in Veterinary Medicine: Ethics, Animal Use, Professional Standards, and Communications (0.8) I. Brooks

Discussion—8 hours. Prerequisite: second-year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Introduction to the important responsibilities of veterinarians to society through their role as health care providers. (S/U grading only.)

437B. Ethics and Issues in Veterinary Medicine (0.8) II. Brooks

Discussion—8 hours. Prerequisite: first-year standing in the School of Veterinary Medicine. Continued introduction to the important responsibilities of veterinarians to society through their role as health care providers. (S/U grading only.)

438. Introduction to Methods of Animal Handling, Restraint, Examination, and Therapy (1) III. East

Laboratory—8 three-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor. Introduction and practice of methods of animal handling and restraint and selected techniques of diagnostic examination and therapy, as well as recognition of animal breeds, breed characteristics and purpose in animal species of veterinary importance. (S/U grading only.)

440. Veterinary Neurology (2.7) I. Bailey

Lecture—21 hours; laboratory—6 three-hour sessions. Prerequisite: third year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Integrated study of the relationship between neuroanatomy, neurophysiology, neuropathology, and the clinical manifestations of the diagnosis of neurological diseases and the use of the various neurodiagnostic aids.

444. Clinical Endocrinology (1.5) II. Feldman

Lecture—12 sessions; discussion—3 sessions. Prerequisite: third-year standing in the School of Veterinary Medicine. A correlated review of common endocrinology disorders affecting the dog and cat.

446. Reproduction (4.2) II. Liu

Lecture—32 hours; laboratory—10 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Structure, function, pathologic, and clinical aspects of reproduction in animals (normal and abnormal).

447. Basic Medicine of Domestic Animals (4.7) III. Cowgill

Lecture—45 hours; laboratory—6 hours. Prerequisite: second year standing in the School of Veterinary Medicine. Introduction to the fundamental principals, clinical manifestations, diagnostic methods and therapeutic approaches common to medical diseases of domestic animals. Preparation for advanced course work in medical diagnosis and therapeutics with specific species focus and orientation.

451. Veterinary Bacteriology and Mycology (4.9) I. Hirsh

Lecture—34 hours; laboratory—15 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate

degree credit. Introduction to the bacterial and fungal agents of animal diseases. Specifically, each microorganism will be discussed with respect to overall significance to animal disease; structural and functional aspects including morphology, cellular composition, and products of medical interest.

452. General Pathology (3.1) I. Wilson

Lecture—18 hours; laboratory—13 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Basic principles of disease and in particular the fundamental mechanisms responsible for creating a disease situation. Illustrations of how the application of general pathological principles is used to determine disease pathogenesis and prognosis.

456. Law and Ethics of the Veterinary Profession (1.6) III. Wilson

Lecture—16 sessions. Prerequisite: third-year standing in School of Veterinary Medicine. Introduction to principles of veterinary medical jurisprudence and legal concepts pertinent to professional activities. (S/U grading only.)

459. Systemic Pathology (4.9) II. MacLachlan

Lecture—35 hours; laboratory—14 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Presents a basic understanding of the pathobiology of major organ systems relevant to a variety of animal species. Emphasis will be on mechanisms of injury, patterns of response to injury and on balance between damage and repair.

470A-470B-470C. Hospital Practices (1.2-1.2-1.2) I, II, III. The Staff (Hjerpe in charge)

Laboratory—8 hours. Prerequisite: third-year standing in the School of Veterinary Medicine. Clinical training in Veterinary Medicine. Assignments in the medical and surgical services and clinical diagnostic facilities of the Veterinary Medical Teaching Hospital. (S/U grading only, pending completion of sequence.)

471. General Practice Clinics (2.5-15) I-II-III; summer (Sessions I and II). Hjerpe

Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rotation). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor. Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of VM Teaching Hospital with equivalent emphasis on small and large animal species. May be repeated for credit. Students in combined DVM/MPVM program enroll for the summer-fall sequence. (S/U grading only, pending completion of three-term sequence.)

472. Urban Practice Clinics (2.5-15) I-II-III. Hjerpe

Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rotation). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor. Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of VM Teaching Hospital with emphasis on those services relating to urban veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Session I-II sequence. (S/U grading only, pending completion of three-term sequence.)

473. Large Animal Practice Clinics (2.5-15) I-II-III. Hjerpe

Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rotation). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor. Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of VM Teaching Hospital with emphasis on those services relating to large animal veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Sessions I-II sequence. (S/U grading only, pending completion of three-term sequence.)

474. Equine Practice Clinics (2.5-15) I-II-III. Hjerpe

Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rota-

tion). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor. Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of VM Teaching Hospital with emphasis on those services relating to equine veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Session I-II sequence. (S/U grading only, pending completion of three-term sequence.)

475. Food Animal Practice Clinics (2.5-15) I-II-III. Hjerpe

Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rotation). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor. Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of VM Teaching Hospital with emphasis on those services relating to food animal veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Sessions I-II sequence. (S/U grading only, pending completion of three-term sequence.)

476. Zoological Practice Clinics (2.5-15) I-II-III. Hjerpe

Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rotation). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor. Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of VM Teaching Hospital with emphasis on those services relating to zoological veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Sessions I-II sequence. (S/U grading only, pending completion of three-term sequence.)

477. Companion Animal Practice Clinics (2.5-15) I, II, II, summer. Hjerpe

Veterinary clinical practices—40 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor (Summer Session students must be enrolled in DVM/MPVM degree program). Clinical training in veterinary medicine. Assignments in the medical and surgical services and clinical diagnostic laboratories of the VM Teaching Hospital with emphasis on small and equine species. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Sessions I-II sequence. (S/U grading only, pending completion of three-term sequence.)

478. Small Animal/Food Animal Practice Clinic (2.5-15) I, II, III, summer. Hjerpe

Veterinary clinical practices—7.5-45 hours per week. Prerequisite: fourth year standing in the School of Veterinary Medicine. Clinical training in veterinary medicine. Students will have assignments in the medical and surgical services and clinical diagnostic laboratories of the Veterinary Medical Teaching Hospital with emphasis on small and food animal species. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Sessions I-II sequence. (S/U grading only.) (Deferred grading, pending completion of sequence.)

490A. Hospital Practices: Small Animal Clinic (2) I, II, III. Ling

Laboratory—10 six-hour sessions. Prerequisite: first-year standing in the School of Veterinary Medicine. Introduction to the procedures, protocol, techniques, and knowledge integral to working in the Small Animal Clinic of the VMTH. (S/U grading only, pending completion of sequence.)

490B. Hospital Practices: Small Animal Clinic (2) I, II, III. Ling

Laboratory—10 six-hour sessions. Prerequisite: second-year standing in the School of Veterinary Medicine and course 490A. Continuation of 490A. (S/U grading only, pending completion of sequence.)

490C. Hospital Practices: Small Animal Clinic (2) I, II, III. Ling

Laboratory—10 six-hour sessions. Prerequisite: third-year standing in the School of Veterinary Medicine

and course 490B. Continuation of 490B. (S/U grading only, pending completion of sequence.)

Viticulture and Enology

(College of Agricultural and Environmental Sciences)

Linda F. Bisson, Ph.D., Chairperson of the Department

Department Office, 1023 Wickson Hall
(916-752-0380)

Faculty

Douglas O. Adams, Ph.D., Associate Professor
Linda F. Bisson, Ph.D., Professor
Roger B. Boulton, Ph.D., Professor (*Viticulture and Enology, Chemical Engineering*)
Susan E. Ebeler, Ph.D., Assistant Professor
Mark A. Matthews, Ph.D., Associate Professor
Carole P. Meredith, Ph.D., Associate Professor
Ann C. Noble, Ph.D., Professor
M. Andrew Walker, Ph.D., Assistant Professor
Andrew L. Waterhouse, Ph.D., Assistant Professor
Larry E. Williams, Ph.D., Professor

Emeriti Faculty

Maynard A. Amerine, Ph.D., Professor Emeritus
James A. Cook, Ph.D., Professor Emeritus
Richard E. Kepner, Ph.D., Professor Emeritus
W. Mark Kliewer, Ph.D., Professor Emeritus
Ralph E. Kunkee, Ph.D., Professor Emeritus
Lloyd A. Lider, Ph.D., Professor Emeritus
Harold P. Olmo, Ph.D., Professor Emeritus
Cornelius S. Ough, D.Sc., Professor Emeritus
Vernon L. Singleton, Ph.D., Professor Emeritus,
Academic Senate Distinguished Teaching Award

Robert J. Weaver, Ph.D., Professor Emeritus
A. Dinsmoor Webb, Ph.D., Professor Emeritus

The Program of Study. Enology is a specialization under the Fermentation Science major; and viticulture is a specialization under the Plant Science and the Agricultural Systems and Environment majors.

Graduate Study. Various graduate groups offer programs of study leading to advanced degrees in the fields of viticulture and enology. For the M.S. or Ph.D. degree see Agricultural and Environmental Chemistry, Chemical Engineering, Ecology, Food Science, Genetics, Horticulture, Microbiology, Plant Biology, Plant Pathology, and Soil Science.

Courses in Viticulture and Enology (VEN)

Lower Division Courses

2. Introduction to Viticulture (2) I. Williams
Lecture—2 hours. Fundamental principles of biology and culture of the grapevine including taxonomy, morphology, physiology, distribution, domestication, utilization, propagation, production systems, harvesting, and storage and processing of grapes. Successful completion of the course should prepare students for upper division courses in viticulture.

3. Introduction to Wine Making (3) I. Noble; II. Meredith; III. Adams
Lecture—3 hours; term paper. This broad overview of wines introduces students having a general interest (or potential fermentation science [enology] majors) to history of wine, physiology of alcohol, wine appreciation, viticulture, fermentation, and wines produced in California and other areas of the United States and world. General Education credit: Civilization and Culture or Nature and Environment.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

101A. Viticultural Practices (2) I. Walker
Discussion-laboratory—4 hours. Prerequisite: course 2. Provides the information required to identify the major wine, raisin, and table cultivars grown in California and elsewhere. Also provides experience in vineyard sampling techniques and vine disease identification.

101B. Viticultural Practices (2) II. Walker
Discussion-laboratory—4 hours. Prerequisite: course 2. Field-oriented experience in the principles and practices of grapevine production, including pruning, propagation, weed identification and control, frost protection, and physical examination of soil profiles and root distribution patterns.

101C. Viticultural Practices (2) III. Walker
Discussion-laboratory—4 hours. Prerequisite: course 2. Field-oriented experience in the principles and practices of grapevine production, including vineyard establishment, vine training, trellising, canopy management practices, irrigation and water management, and methods of crop adjustment for improvement of fruit quality.

110. Grapevine Growth and Physiology (3) III. Matthews
Lecture—3 hours. Prerequisite: course 2. Botanical aspects including morphology and domestication will precede lectures covering flower development and energy budget concepts. Impact of physiological variables such as photosynthesis translocation, mineral nutrition, and water relations on fruit ripening and composition will be covered.

111. World Viticulture (3) III. Meredith
Lecture—3 hours. Prerequisite: upper division standing. Study of the diversity of viticulture, both geographical and historical. History of grape growing and its spread throughout the world will be covered, along with discussions of current viticultural practices in different parts of the world, including California.

***115. Raisin and Table Grape Production** (2) I. Williams
Lecture—2 hours. Prerequisite: course 2. Overview of the raisin and table grape industries in California and other production areas of the world. Cultural practices associated with raisin and table grape production will also be discussed. Offered in alternate years.

116. Winegrape Production (3) II. Matthews
Lecture—3 hours. Prerequisite: course 2. Covers principles underlying cultural practices associated with winegrape production, including establishing and planting, training, summer and winter pruning, canopy management, irrigation, mineral nutrition, weed control, frost protection, crop regulation, and harvesting.

***118. Grapevine Pests, Diseases and Disorders** (3) I. Williams
Lecture—3 hours. Prerequisite: course 2. Describes the various pests and diseases of vineyards throughout California. Pest/disease identification and control methods (to include sampling techniques) also will be discussed. Integrated management approach to pest control methods will be emphasized. Offered in alternate years.

123. Analysis of Musts and Wines (3) I. Waterhouse
Lecture—2 hours; laboratory—3 hours. Prerequisite: Chemistry 2A, 2B, 2C, 8A, and 8B. Open to undergraduate students in Fermentation Science and Plant Science, and graduate students in Agricultural and Environmental Chemistry, Food Science, Horticulture, and Microbiology. Principles of grape juice and wine analysis, and the reasons for use of each analysis. Analyses of a practical and useful nature are chosen for the laboratory exercises demonstrating various chemical, physical, and biochemical methods.

124. Wine Production (4) I. Bisson
Lecture—2 hours; laboratory—3 hours; independent study—3 hours. Prerequisite: course 3 and Biological Sciences 102; course 123 (may be taken concurrently). Open to undergraduate students in Fermentation Science, Microbiology, Biochemistry and Plant Science; and graduate students in Agricultural and Environmental Chemistry, Food Science, Horticulture, and Microbiology. Principles and practice of making

the various standard types of wines, with special reference to the grape varieties used and the method of vinification required for each.

125. Wine Types and Sensory Evaluation (3) II. Noble
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 124, Agricultural Systems and Environment 120, and consent of instructor. Open to upper division students in Fermentation Science and Plant Science, and graduate students in Agricultural and Environmental Chemistry, Food Science, Horticulture, and Microbiology; or consent of instructor. Major types of wines and the factors influencing their quality; principles of sensory evaluation.

126. Wine Processing (4) II. Boulton
Lecture—2 hours; laboratory—3 hours; discussion—1 hour. Prerequisite: course 124. Principles of equilibrium and rates of various physical and chemical reactions in wines; treatment of unstable components in wines by adsorption, ion exchange, refrigeration, filtration, and membrane processes.

128. Wine Microbiology (4) III. Bisson
Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 123, 124; courses 125, 126 recommended. Nature, development, physiology, biochemistry, and control of yeasts and bacteria involved in the making, aging, and spoilage of wines. (Former course 217.)

130. Management, Marketing, and Economics of the California Wine Industry (9) III. The Staff
Lecture—24 hours; lecture/discussion—4 hours; fieldwork—8 hours. Prerequisite: course 124. Introduction to management, marketing and economics of wine in the United States with particular emphasis on California. Reviews market segmentation and explores alternative strategies for grape acquisition, production, brand development, distribution, and social policy formation. (Deferred grading only.)

135. Wine Processing Equipment (1) II. Boulton
Lecture—1 hour; field trip. Prerequisite: courses 124, 126; Food Science and Technology 110A, 110B recommended. A course for undergraduates which provides a systematic description of unit operations and processing equipment used in modern commercial winemaking. Emphasis is given to the principles and techniques of operation and to the performance of this equipment with grapes, juices, and wines.

***140. Distilled Beverage Technology** (3) III. Boulton
Lecture—3 hours. Prerequisite: Chemistry 8B; Food Science and Technology 110A. Distillation principles and practices; production technology of brandy, whiskey, rum, vodka, gin, and other distilled beverages; characteristics of raw materials, fermentation, distillation, and aging. Offered in alternate years.

***186. Fermentation Science** (3) III. Ogrzydzak (Food Science and Technology)
Lecture—3 hours. Prerequisite: Microbiology 102, Biological Sciences 103. Basic principles of fermentation science and biotechnology with emphasis on industrial fermentation processes that generate useful products including fermented food and beverages, pharmaceuticals, fine chemicals, and other gene products. Offered in alternate years.

190X. Winemaking Seminar (1) III. The Staff
Seminar—1 hour; discussion—1 hour; research paper. Prerequisite: course 3. Weekly seminar presented by outside speakers on a specific winemaking topic chosen for the quarter. Discussion follows with the speaker hosted by the faculty member in charge. May be repeated twice for credit.

192. Internship (1-12) I, II, III, summer. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units. Work experience related to Fermentation Science (Enology) or Plant Science (Viticulture) majors. Internships must be approved and supervised by a member of the department or major faculty, but are arranged by the student. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Graduate Courses

210. Grape Development and Composition (4) III. Polito, Adams

Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 102, 103. The anatomy, physiology and biochemistry of grape berry development, with emphasis on the development of grape composition relevant to winemaking. Offered in alternate years.

216. Vineyard Establishment and Development (3) I. The Staff

Lecture/discussion—2 hours; fieldwork—3 hours. Prerequisite: courses 110, 115 or 116, or consent of instructor. Application of basic knowledge in viticulture, meteorology, soil, water, plant, and biological sciences to establishment and development of vineyards. To prepare a comprehensive feasibility study of suitability of a given piece of property for growing wine, raisin, or table grapes. Offered in alternate years.

***219. Plant Phenolics** (3) II.

Lecture—3 hours. Prerequisite: Biological Sciences 102, 103, or the equivalent and consent of instructor. Flavonoids and other natural phenolic substances of plants; their chemistry, natural occurrence, biochemistry, relation to animal diets, and relation to properties of foods and other products.

235. Winery Design and Economics (5) II. Boulton
Lecture—2 hours; discussion—1 hour; studio—6 hours. Prerequisite: course 124, 135; Food Science and Technology 110A recommended. Design of wineries. Includes process calculations, equipment selection, process layout and building choice and siting. Project scheduling, capital costs and ten-year cash flow analysis for the winery. Grading based on design project.

270. Critical Evaluation of Scientific Literature (1) I, II, III. Bisson

Discussion—2 hours. Prerequisite: consent of instructor. Contemporary research topics in biological sciences. Students choose, present and lead discussion of recent research articles in a special topic area chosen by instructor. Intended to develop skills in critical evaluation of scientific publications. May be repeated for credit. (S/U grading only.)

290. Seminar (1) II, III. Adams

Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

290C. Advanced Research Conference (1) I, II, III. Research Faculty

Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Planning and results of research programs, proposals, and experiments. Discussion and critical evaluation of original research being conducted by the group. Discussion led by individual research instructors for research group. May be repeated for credit. (S/U grading only.)

291. Advances in Viticulture (1) II. Matthews

Seminar—1 hour. Prerequisite: consent of instructor. Experts in various fields of viticulture will lead discussions on recent advances in their fields of expertise. Emphasis and topics will vary from year to year and course may be repeated for credit. (S/U grading only.)

292. Advances in Enology (1) III. Waterhouse
Discussion—1 1/2 hours, seven to ten weeks. Prerequisite: courses 123, 124, 125, 126. Discussions of previously assigned reading material, usually in the form of two to three reprints. Discussions led by faculty to acquaint students with their current research interests. May be repeated for credit. (S/U grading only.)

297T. Tutoring in Viticulture and Enology (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: graduate standing and consent of instructor. Designed for graduate students who desire teaching experience, but are not teaching assistants. Student contact primarily in laboratory or discussion sections, and under direction of a faculty member. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

War-Peace Studies

(College of Letters and Science)

The interdisciplinary minor in War-Peace Studies examines the causes and dynamics of intra- and international wars and efforts to prevent and settle such conflicts.

Students in the minor are encouraged to participate in the educational activities of the Davis Program of the UC Institute on Global Conflict and Cooperation (IGCC).

The minor is sponsored by the International Relations Program.

Minor Program Requirements:

UNITS

War-Peace Studies20
Approaches

One or two courses from the following:

Anthropology 123B, 131
Comparative Literature 157
Philosophy 115, 118
Physics/Applied Science 137
Political Science 121, 122, 123, 124, 132, 176
Sociology 119, 157
Women's Studies 102

Northern and Western Regions

One or two courses from the following:

Geography 124
History 134A, 137C, 142, 143, 144, 145, 170B, 171B, 174B
Native American Studies 130B
Political Science 130, 131, 136

Southern and Eastern Regions

One or two courses from the following:

Anthropology 142, 143, 144
Economics 170
History 165, 190C, 194C
Native American Studies 120
Political Science 126, 134, 145, 149, 178

Restriction: No more than two courses from a single department may be offered in satisfaction of the minor requirements.

Advising. International Relations Program, 916-752-3063.

Water Science

See Hydrologic Science

Water Science (A Graduate Group)

Students admitted into the Water Science Graduate Group before June 30, 1993 will be allowed to complete their degree in this subject.

New students should see the Hydrologic Science Graduate Group section in this catalog.

Information. K. Tanji (*Land, Air and Water Resources*), 127 Veihmeyer Hall (916-752-6540).

Wildlife and Fisheries Biology

(College of Agricultural and Environmental Sciences)

Joseph J. Cech, Jr., Ph.D., Chairperson of the Department

Department Office, 1088 Academic Surge (916-752-6586)

Faculty

Daniel W. Anderson, Ph.D., Professor
Louis W. Botsford, Ph.D., Professor
Tim Caro, Ph.D., Associate Professor
Joseph J. Cech, Jr., Ph.D., Professor
Ronald E. Cole, B.S., Lecturer
Chris Dewees, Ph.D., Lecturer
Nadine K. Jacobsen, Ph.D., Associate Professor
Dale F. Lott, Ph.D., Professor
Rex E. Marsh, A.B., Lecturer
Peter B. Moyle, Ph.D., Professor
Dirk Van Vuren, Ph.D., Assistant Professor

Emeriti Faculty

Walter E. Howard, Ph.D., Professor Emeritus
Robert G. Schwab, Ph.D., Professor Emeritus

The Major Program

The wildlife and fisheries biology major deals with the relationships between the needs of people and the requirements of wildlife. Understanding these relationships is vital for the maintenance of ecological diversity, recreational resources, and food supplies for future generations.

The Program. Because of the diversity of problems in the field, emphasis in the major is placed on broad training in biological and physical sciences, with specialization in one of seven areas. The major is designed primarily for students interested in eventually becoming professionals in wildlife and fisheries biology, but its breadth of course requirements, when combined with suitable electives, also make it suitable as a preparatory major for such areas as veterinary medicine and secondary school teaching. Certification by professional societies such as The Wildlife Society, American Fisheries Society, or the Ecological Society of America or preparation for specialized resource-related graduate studies may also be achieved by careful planning of electives with a faculty adviser.

Career Alternatives. Positions now held by graduates in this major include wildlife, fisheries, animal control, and resource biologists and managers with local, state and federal agencies. Some graduates are biologists or consultants with private industries such as commercial fishing businesses, electrical utilities, sportsman's clubs, aquaculture operations, and environmental consulting firms. Also, some are veterinarians, medical physicians, and professors/researchers who teach and/or conduct research in academic institutions.

B.S. Major Requirements:

	UNITS
Written/Oral Expression	4-8
English 1	4
Rhetoric and Communication	4
Preparatory Subject Matter	47-53
Biological sciences (Biological Sciences 1A, 1B, 1C)	15
Chemistry (Chemistry 2A, 2B, and 8A)	13
Computer science (Agricultural Systems and Environment 21)	3
Mathematics (Mathematics 16A, 16B)	6
Physics (Physics 1A, 1B or 5A, 5B, 5C)	6-12
Statistics (Statistics 100, 102 or Agricultural Systems and Environment 120)	4
Breadth/General Education	6-24
Satisfaction of General Education requirement	
Depth Subject Matter	49-61
Ecology (Environmental Studies 100 or Evolution and Ecology 101)	4
Evolution (Evolution and Ecology 100)	4
Genetics (Biological Sciences 101)	4
Physiology (Neurobiology, Physiology and Behavior 101)	5
Vertebrate anatomy (Anatomy 100 or Evolution and Ecology 170)	3-4
Organismal core: Choose three lecture courses and two (laboratory) courses. [Wildlife and Fisheries Biology 110, (110L), 111, (111L), 120, (120L), or Evolution and Ecology 134, (134L)]	12-13
Disciplinary core (Wildlife and Fisheries Biology 122, 140 or 141, and either 121 or 130)	11-12
Statistics: Choose one course (two recommended) from Statistics 104, 106, 108 or 110	3-8
Research methods (Wildlife and Fisheries Biology 100 or 102 and 102L)	3-7
Restricted Electives	9-24
Choose one from the seven Areas of Specialization shown below.	
Unrestricted Electives	10-65
Total Units for the Degree (minimum)	180

Areas of Specialization

- Behavioral ecology:** Choose one course from each group:
 - Neurobiology, Physiology and Behavior 102 or Psychology 134;
 - Entomology 104, Environmental Studies 101 or Anthropology 154A-154B; and
 - Environmental Studies 128, Statistics 110, Wildlife and Fisheries Biology 151 or Range Science 135.
- Conservation biology:** Complete Wildlife and Fisheries Biology 154 and Evolution and Ecology 102. Choose one course from each group:
 - Botany 144, Entomology 147, Geography 173, Evolution and Ecology 117, 138, 144 or 147;
 - Economics 123, Environmental Studies 161, 166 or Geography 161.
- Ecotoxicology and disease ecology:** Complete Wildlife and Fisheries Biology 153, Chemistry 8B, Biological Sciences 102, 103. Choose two courses from a and one from b, or one from a and two from b:
 - Environmental Toxicology 101, 112A (112B recommended), 132, 138 or Water Science 41; and
 - Clinical Pathology 101, Medical Microbiology 115 or 116.
- Fisheries biology:** Complete Wildlife and Fisheries Biology 102, 120, 120L, 121, Chemistry 8B, Biological Sciences 102, 102L, 103, and:
 - One course from Entomology 116 or Evolution and Ecology 112-112L; and

b. Two courses from Environmental Studies 116 (or 150C), 151 or Water Science 122.

- Physiological ecology:** Complete Wildlife and Fisheries Biology 121 and 130, Chemistry 8B, Biological Sciences 102, 103. Choose two courses from Biological Sciences 121, Environmental Studies 129-129L or Neurobiology, Physiology and Behavior 140.
- Vertebrate pest ecology:** Complete Wildlife and Fisheries Biology 151, Agronomy 100, Chemistry 8B, Biological Sciences 102, 103, and choose one course from Botany 120, 121, Entomology 110 or 115.
- Wildlife biology:** Complete Wildlife and Fisheries Biology 100, 110-110L, 111-111L, 130, 151 and:
 - Choose two courses from Plant Biology 102 (or 108), 117, Range Science 133, 134;
 - Choose one course from Wildlife and Fisheries Biology 131, 136 or Range Science 135.

Major Adviser. Students transferring to Davis from another institution or new students declaring the major of Wildlife and Fisheries Biology must consult the Master Adviser so that their program can be evaluated and a faculty adviser assigned. See receptionist in 1088 Academic Surge Building or telephone 752-6586.

Graduate Study. See the Graduate Studies section in this catalog.

Courses in Wildlife and Fisheries Biology (WFB)**Lower Division Courses**

10. Wildlife Ecology and Conservation (4) I. Lott, Moyle

Lecture—3 hours; discussion—1 hour. Introduction to the ecology and conservation of vertebrates. Complexity and severity of world problems in conserving biological diversity. General Education credit: Nature and Environment.

92. Internship (1-6) I, II, III. The Staff (Department Chairperson in charge)

Internship—3-18 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in all subject areas offered in the department. Internships supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Field Methods in Wildlife Biology (3) III. The Staff (Chairperson in charge)

Lecture—10 hours total; laboratory—40 hours total (7 days). Prerequisite: courses 110, 110L, 111, 111L, and Evolution and Ecology 101, or the equivalent courses, and consent of instructor. Methods for research in ecology and conservation of wild birds and mammals. Emphasis on the study of demography, intraspecific and interspecific interactions, activity budgets, home range, diets, and on report writing. Held between winter and spring quarters. Limited enrollment.

102. Field Studies in Fish Biology (1) III. Moyle, Cech

Lecture/discussion—1 hour. Prerequisite: upper division course in each of ecology, aquatic biology, fish biology, and statistics, and consent of instructor. Emphasis on theory of quantitative fish capture methods and design of individual research projects on ecology, behavior, physiology or population biology of fishes. Offered in alternate years.

102L. Field Studies in Fish Biology: Laboratory (6) III. Moyle, Cech

Fieldwork—15 hours; laboratory—12 hours; discussion/laboratory—3 hours. Prerequisite: course 102, upper division course in each of ecology, aquatic biology, fish biology, and statistics, and consent of instructor. Field investigations of fish biology are emphasized including quantitative capture methods

and individual research projects on ecology, behavior, physiology or population biology of fishes at the field site in relation to their habitats. Offered in alternate years. (Deferred grading pending completion of projects.)

110. Biology and Conservation of Wild Mammals (3) III. The Staff (Chairperson in charge)

Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C; course in ecology recommended. Biology and conservation of wild mammals. Natural history, taxonomy, geographical-ecological distribution; anatomical-physiological-behavioral adaptations of mammals to their environment; and research/management techniques are emphasized.

110L. Laboratory in Biology and Conservation of Wild Mammals (2) III. The Staff (Chairperson in charge)

Laboratory—6 hours. Prerequisite: course 110 (may be taken concurrently) and consent of instructor. Laboratory exercises in the morphology, systematics, species identification, anatomy, and adaptations of wild mammals to different habitats. Limited enrollment.

111. Biology and Conservation of Wild Birds (3) I. Anderson

Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, and Evolution and Ecology 101. Phylogeny, distribution, migration, reproduction, population dynamics, behavior and physiological ecology of wild birds. Emphasis on adaptations to environments, species interactions, management, and conservation.

111L. Laboratory in Biology and Conservation of Wild Birds (2) I. Anderson

Laboratory—6 hours. Prerequisite: course 111 (may be taken concurrently); consent of instructor. Laboratory exercises in bird species identification, anatomy, molts, age and sex, specialized adaptations, behavior, research, with emphasis on conservation of wild birds. Limited enrollment.

120. Biology and Conservation of Fishes (3) I. Moyle

Lecture—3 hours. Prerequisite: Biological Sciences 1B. Introduction to evolution, ecology, and conservation of marine and freshwater fishes.

120L. Laboratory in Biology and Conservation of Fishes (1) I. Moyle

Laboratory—3 hours. Prerequisite: course 120 (may be taken concurrently). Morphology, taxonomy, conservation, and identification of marine and freshwater fishes with emphasis on California species. Limited enrollment.

121. Physiology of Fishes (4) II. Cech

Lecture—3 hours; laboratory—3 hours. Prerequisite: upper division courses in nutrition and physiology or consent of instructor. Comparative physiology, growth, reproduction, behavior, and energy relations of fishes.

122. Population Dynamics and Estimation (4) III. Botsford

Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 16A-16B; Statistics 13 or the equivalent; an upper division course in ecology. Description of bird, mammal and fish population dynamics, modeling philosophy, techniques for estimation of animal abundance (e.g., mark-recapture, change-in-ratio, etc.), mathematical models of populations (e.g., Leslie matrix, logistic, dynamic pool, stock-recruitment); case histories.

123. Freshwater Invertebrate Ecology (4) III. Erman

Lecture/discussion—2 hours; laboratory—3 hours; fieldwork—3 hours; one all-day Saturday field trip required. Prerequisite: Biological Sciences 1A and 1B or the equivalent. Ecology and classification of freshwater invertebrates with emphasis on life history, habitat, diversity, and behavior. Invertebrate monitoring to assess environmental impacts and classification based on morphology as a tool for understanding ecology and biology of aquatic organisms.

- 130. Physiological Ecology of Wildlife** (4) II. Jacobsen
Lecture—4 hours. Prerequisite: course 110, 111, or 120; Neurobiology, Physiology and Behavior 101; and Evolution and Ecology 101. Animal functions, adaptations, and ecological energetics of wildlife. Nutrition, metabolism, and productivity are emphasized as a pattern of relationships for understanding the distribution and abundance of wild ectotherms and endotherms in time and space.
- 131. Biology and Management of Cervidae** (3) III. Jacobsen
Lecture—2 hours; laboratory—3 hours. Prerequisite: Neurobiology, Physiology and Behavior 101 and Evolution and Ecology 101, or the equivalent; course 110 recommended. Evolution, biology, and management of cervids. Topics include differences in nutritive ecology, bioenergetics, reproduction and growth, use of habitats, and research methodologies. Emphasis on North American species of caribou, elk, moose, and deer. Offered in alternate years.
- 136. Ecology of Waterfowl and Game Birds** (3) II. The Staff (Chairperson in charge)
Lecture—2 hours; laboratory—3 hours; field trip. Prerequisite: courses 111 and 111L or the equivalent. Detailed examination of distribution, behavior, population dynamics, and management of waterfowl and upland game birds. Offered in alternate years.
- 140. Ecology and Evolution of Vertebrate Social Organization** (4) II. Lott
Lecture—4 hours. Prerequisite: Biological Sciences 1B or upper division ecology course (Evolution and Ecology 101 or the equivalent). Spacing competition, cooperation, and grouping of wild vertebrates are described and analyzed as adaptive products of their evolutionary history and ecology. Minimal consideration is given to humans and other primates. Offered in alternate years.
- *141. Behavioral Ecology** (3) II. Caro
Lecture—3 hours. Prerequisite: Evolution and Ecology 101. Basic theories underlying the functional and evolutionary significance of behavior, and the role of ecological constraints. Supporting empirical evidence taken mainly from studies of wild vertebrates. Offered in alternate years.
- 151. Wildlife Ecology** (3) I. Van Vuren
Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B, and 1C, or the equivalent. Population ecology of wild vertebrates, particularly habitat selection, demography, competition, predation, population growth, and regulation set in the context of human-caused degradation of environments in North America.
- 153. Wildlife Ecotoxicology** (4) II. Anderson
Lecture—3 hours; discussion—1 hour. Prerequisite: introductory courses in organic chemistry, ecology, and physiology, or consent of instructor; Environmental Toxicology 101 recommended. Various forms of environmental pollution in relation to fish and wildlife, the effects and mechanisms of pollutants, effects on individuals and systems, laboratory and field ecotoxicology, examples/case histories, philosophical/management considerations. Offered in alternate years.
- 154. Conservation Biology** (3) III. Caro
Lecture—3 hours. Prerequisite: Evolution and Ecology 101 or Environmental Studies 100. Introduction to conservation biology. Background to the biological issues and controversies surrounding loss of species and habitats.
- 190. Proseminar in Wildlife and Fisheries Biology** (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: upper division standing in biological sciences or consent of instructor. Reports and discussions of recent advances related to wildlife and fisheries biology. May be repeated twice for credit. (P/NP grading only.)
- 190C. Research Group Conference** (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: advanced standing; consent of instructor. Weekly conference on research problems, progress and techniques in wildlife and fisheries biology. May be repeated for credit. (P/NP grading only.)

- 191. Museum Science** (2) II. Cole
Lecture—1 hour; laboratory—3 hours. Prerequisite: upper division standing and consent of instructor. Principles and methods required to preserve and present biological specimens for research, teaching collections, and museums. Offered in alternate years. (P/NP grading only.)
- 192. Internship** (1-12) I, II, III, summer. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in all subject areas offered in the department. Internships supervised by a member of the faculty. (P/NP grading only.)
- 195. Field and Laboratory Research** (3) I, II, III. The Staff (Chairperson in charge)
Laboratory—6 hours; discussion—1 hour. Prerequisite: course 110L, 111L, or 120L; 121 or 130; Evolution and Ecology 101 or the equivalent; and consent of instructor. Critique and practice of research methods applied to field and/or laboratory environments of wild vertebrates. Students work independently or in small groups to design experimental protocol, analyze data, and report their findings. May be repeated twice for credit.
- 197T. Tutoring in Wildlife and Fisheries** (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: major in Wildlife and Fisheries Biology and consent of instructor. Experience in teaching under guidance of faculty member. (P/NP grading only.)
- 198. Directed Group Study** (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)
- 199. Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

- 201. Field Research in Wildlife Biology** (6) Extra-session summer. The Staff (Chairperson in charge)
Lecture—1 hour; laboratory—40 hours; individual research projects and oral and written reports. Prerequisite: courses 140, 110, or 111-111L, Evolution and Ecology 101, Statistics 102, or the equivalent; consent of instructor. Field research in wildlife biology; formulation of testable hypotheses, experimental design, execution of the study, data reduction, and preparation of suitable written and oral reports. Limited enrollment. Preference given to graduate students in wildlife areas of study. (S/U grading only.)
- 222. Advanced Population Dynamics** (3) II. Botsford
Lecture—3 hours. Prerequisite: graduate standing; advanced course in ecology (e.g., Evolution and Ecology 101), population dynamics (e.g., course 122), and one year of calculus; familiarity with matrix algebra and partial differential equations recommended. Logical basis for population models, evaluation of simple ecological models, current population models with age, size, and stage structure, theoretical basis for management and exemplary case histories. Emphasis on development and use of realistic population models in ecological research.
- 252. Principles of Vertebrate Control** (3) I. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Principles and concepts concerning the ecological, behavioral, economic, philosophical, and historical basis of managing wild vertebrates that have become pests.
- 290. Seminar** (1-3) I, II, III. The Staff (Chairperson in charge)
Seminar—1-3 hours. Prerequisite: consent of instructor. Seminar devoted to a highly specific research topic in any area of wildlife or fisheries biology. Special topic selected for a quarter will vary depending on interests of instructor and students. (S/U grading only)
- 290C. Research Group Conference** (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: consent of instructor. Weekly conference on research problems, progress and techniques in wildlife and fishery sciences. May be repeated for credit. (S/U grading only.)

- 291. Seminar in Aquatic Ecology** (2) III. Moyle
Seminar—2 hours. Prerequisite: graduate standing in biology. Presentation and analysis of assigned topics in aquatic ecology emphasizing fish, fisheries and aquatic conservation. Offered in alternate years. (S/U grading only.)

- *292. Physiology of Fishes Seminar** (1) I. Cech
Seminar—1 hour. Prerequisite: graduate standing and at least two courses in physiology; consent of instructor. Seminar devoted to current topics concerning the physiological functioning of fishes. May be repeated twice for credit. (S/U grading only.)

- 293. Seminar in Wildlife Disease Ecology** (2) III. Theis (Medical Microbiology) in charge, Jacobsen
Seminar—2 hours. Prerequisite: graduate standing or advanced undergraduate in biology. Presentation and analysis of assigned research papers on disease ecology of wild vertebrates related to considerations of habitat quality, population regulation, wildlife management, and/or implications for human or domestic animal health. (S/U grading only.)

- 294. Seminar in Behavioral Ecology of Predators and Prey** (3) II. Caro
Seminar—2 hours; term paper. Prerequisite: graduate standing in biology. Presentation and analysis of research papers on social and foraging behavior of predatory animals, anti-predator strategies of prey species, co-evolution of predators and prey, and ecology of predator-prey interactions. May be repeated twice for credit. Offered in alternate years.

- 295. Seminar in Wildlife Ecotoxicology** (3) II. Anderson
Seminar—2 hours; term paper required. Prerequisite: graduate standing in biology. Presentation and analysis of assigned and searched research papers on transport, exposure, and effects of environmental contaminants on wildlife-associated ecosystem components, especially at individual/population levels. Specific subjects vary each offering. Offered in alternate years. (S/U grading only.)

- 297T. Supervised Teaching in Wildlife and Fisheries Biology** (1-3) I, II, III. The Staff (Chairperson in charge)
Tutorial—3-9 hours. Prerequisite: meet qualifications for teaching assistant; graduate standing; and consent of instructor. Tutoring and teaching students in undergraduate courses in Wildlife and Fisheries Biology. Weekly conferences with instructor; evaluations of teaching; preparing for and conducting demonstrations, laboratories, and discussions; preparing and grading examinations. May be repeated for a total of 6 units when a different course is tutored. (S/U grading only.)

- 298. Group Study** (1-5) I, II, III. The Staff (Chairperson in charge)
Lectures and/or discussions—1-5 hours.

- 299. Research** (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Women's Studies

(College of Letters and Science)
Linda Morris, Ph.D. Program Director
Program Office, 271 Kerr Hall (916-752-4686)

Committee in Charge

Rosa Linda Fregoso, Ph.D. (*Chicano Studies, Women's Studies*)
Wendy Ho, Ph.D. (*Asian American Studies, Women's Studies*)
Carole Joffe, Ph.D. (*Sociology, Women's Studies*)
William E. Kleb, D.F.A. (*Dramatic Art*)
Kari Lokke, Ph.D. (*English, Comparative Literature*)
Lata Mani, Ph.D. (*Women's Studies*)
Linda A. Morris, Ph.D., ex officio (*English*)
Judith Newton, Ph.D. (*Women's Studies*)

Belinda Robnett, Ph.D. (*Sociology, Women's Studies*)
 Juliana Schiesari, Ph.D. (*Italian*)
 Judith Stacey, Ph.D. (*Sociology, Women's Studies*)

Faculty

Charlayne Allan, Lecturer (*Classics*)
 Cynthia L. Brantley, Ph.D., Associate Professor (*History*)
 JoAnn Cannon, Ph.D., Professor (*French and Italian*)
 Angie Chabram, Ph.D., Associate Professor (*Chicano Studies*)
 Karen P. Ericksen, Ph.D., Professor (*Psychology*)
 Diane Felmlee, Ph.D., Associate Professor (*Sociology*)
 Paula Findlen, Ph.D., Associate Professor (*History*)
 Gail Finney, Ph.D., Professor (*Comparative Literature, German*)
 Yvette Flores-Ortiz, Ph.D., Assistant Professor (*Chicano Studies*)
 Ruth Frankenberg, Ph.D., Assistant Professor (*American Studies*)
 Rosa Linda Fregoso, Ph.D., Associate Professor (*Chicano Studies, Women's Studies*)
 Zunilda Gertel, Ph.D., Professor (*Spanish and Classics*)
 Sandra Gilbert, Ph.D., Professor (*English*)
 Karen Halttunen, Ph.D., Professor (*History*)
 Michele Hannoosh, Ph.D., Associate Professor (*Comparative Literature*)
 Inés Hernandez, Ph.D., Assistant Professor (*Native American Studies*)
 Lynn Hershman, M.F.A., Professor (*Art*)
 Wendy Ho, Ph.D., Assistant Professor (*Asian American Studies, Women's Studies*)
 Sarah B. Hrdy, Ph.D., Professor (*Anthropology*)
 Mary Jackman, Ph.D., Professor (*Sociology*)
 Carole Joffe, Ph.D., Professor (*Sociology, Women's Studies*)
 Suad Joseph, Ph.D., Professor (*Anthropology*)
 Susan Kaiser, Ph.D., Associate Professor (*Textiles and Clothing*)
 William E. Kleb, D.F.A., Professor (*Dramatic Art*)
 Cathy Kudlick, Ph.D., Assistant Professor (*History*)
 Anna K. Kuhn, Ph.D., Professor (*German*)
 Kari Lokke, Ph.D., Associate Professor (*Comparative Literature*)
 Dianne Sachko Macleod, Ph.D., Associate Professor (*Art History*)
 Martha Macri, Ph.D., Assistant Professor (*Anthropology, Native American Studies*)
 Lata Mani, Ph.D., Assistant Professor (*Women's Studies*)
 Susan Mann, Ph.D., Professor (*History*)
 Sandra J. McPherson, B.A., Professor (*English*)
 Jay Mechling, Ph.D., Professor (*American Studies*)
 Janet Momsen, Ph.D., Professor (*Geography*)
 Patricia Moran, Ph.D., Assistant Professor (*English*)
 Linda Morris, Ph.D., Senior Lecturer (*English, Women's Studies*)
 Judith Newton, Ph.D., Professor (*Women's Studies*)
 Beatriz M. Pesquera, Ph.D., Associate Professor (*Chicano Studies*)
 Michele Praeger, Ph.D., Associate Professor (*French and Italian*)
 Donna Reed, Ph.D., Lecturer (*Comparative Literature*)
 Ada Riddell, Ph.D., Professor (*Chicano Studies*)
 Belinda Robnett, Assistant Professor (*Sociology, Women's Studies*)
 Irit Rogoff, Ph.D., Associate Professor (*Art Studio*)
 Ruth E. Rosen, Ph.D., Professor (*History*)
 Seth Schein, Ph.D., Professor (*Comparative Literature*)
 Juliana Schiesari, Ph.D., Associate Professor (*French and Italian*)
 Stephanie A. Shields, Ph.D., Professor (*Psychology*)
 Carol Smith, Ph.D., Professor (*Anthropology*)
 Barbara Sommer, Ph.D., Lecturer (*Psychology*)
 Judith Stacey, Ph.D., Professor (*Sociology, Women's Studies*)
 Margit Stange, Ph.D., Assistant Professor (*English*)
 Lenora A. Timm, Ph.D., Professor (*Linguistics*)

Carol Tomlinson-Keasey, Ph.D., Professor (*Psychology*)
 Patricia Turner, Ph.D., Associate Professor (*African American Studies, American Studies*)
 Martha West, J.D., Professor (*Law*)
 Diane Wolf, Ph.D., Associate Professor (*Sociology*)

The Major Program

Women's Studies is an interdisciplinary major founded on the premise that gender is a historically variable construction that centrally shapes the historical experience and everyday lives of women as well as men. Women's Studies also assumes that gender, race, class, and sexual and national identities are constructed in relation to each other. The intersections of these categories of experience as well as the history of debate over what these categories mean is an important strand of the Women's Studies curriculum. Women's Studies at UCD is particularly rich in faculty doing comparative, cross-cultural work on women and gender. Among the faculty offering courses for the major are scholars working on women and gender in Africa, the Caribbean, the Americas, China, Europe, Japan, India, various countries of the Middle East, Southeast Asia, and the United States.

The Program. Students majoring in this field may take courses in African American and African studies, American studies, anthropology, comparative literature, English, history, linguistics, Chicana/o studies, political science, psychology, sociology, Asian American studies, Native American studies, French, German, Italian, Spanish, textiles and clothing, and other related disciplines. Depending on individual career goals, each student will design a program in consultation with an adviser.

Career Alternatives. Women's Studies prepares undergraduates for a variety of careers. The B.A. degree in Women's Studies, for example, provides excellent grounding for undergraduates with career aspirations in law, medicine, public administration, and social services. Students wishing to pursue doctoral work will also find that interdisciplinary training in Women's Studies equips them with theoretical and methodological strengths in most disciplines and applied research fields. Increasingly, too, specialists in Women's Studies are being used as consultants in industry, higher education, insurance companies and personnel firms. State and federal government agencies require people who have special training in understanding gender relations. Finally, educational institutions need specialists to develop and administer women's studies programs, women's centers, and other institutional structures designed specifically to study and assist women.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	20
Two courses from Women's Studies 20, 50, 70	8
Three courses selected from the following ..	12
African American and African Studies 10, 15, American Studies 1E, 1F, Anthropology 2, Art History 15, Asian American Studies 1, 2, Chicano/a Studies 10, 20, Classics 15, Comparative Literature 12, English 30A or 30B, 45, 46A or 46B or 46C, History 72A, 72B, Native American Studies 1, 10, Psychology 1, Sociology 1, 2, 3, Women's Studies 80.	
Depth Subject Matter	44
Choose one of two tracks: (1) <i>Disciplinary</i> or (2) <i>Thematic</i> . Each track consists of three parts (A, B, C).	
(A) Core courses in Women's Studies	16
Disciplinary track and Thematic track	
Women's Studies 103, 104, 190 and one additional upper division Women's Studies course.	

(B) Cross-Cultural Requirement

Disciplinary track and Thematic track
 Choose four courses (at least one from each category). Courses used to meet this requirement may not duplicate those used to meet the requirement for Part C, Major Emphasis. The list that follows represents a partial list of options; other courses may be included with the consent of the Women's Studies Adviser.

Ethnic Studies: Women of Color in the United States

African American and African Studies 123, 133, Anthropology 139, Asian American Studies 112, Chicano/a Studies 102, 122, Native American Studies 180, Sociology 134.

Cultures Outside the United States

Anthropology 131, 133, Comparative Literature 135, 138, 159C, English 185A, 185B, French 133, German 129, History 102G, 102H, 148A, 148B, Italian 141, Sociology 145B, Women's Studies 102.

Historical Material Prior to 1900

Asian American Studies 112, English 185A, History 102G, 102H, 148A, 148B, Italian 141, Native American Studies 180.

(C) Gender-based Courses

Disciplinary track:

Choose three courses from one of the following focus groups:

Anthropology focus

Anthropology 130, 131, 134, 139, 148B, 158.

History focus

History 102H, 102G, 148A, 148B.

Literature and Language focus

Comparative Literature 135, 138, 159C, English 181, 185A, 185B, French 133, German 129, Italian 141, Linguistics 113.

Sociology and Psychology focus

Chicano/a Studies 122, Psychology 114, 149, Sociology 131, 132, 133, 134, 145B, 172.

OR

Thematic track:

Choose three courses that form a thematic cluster (for example, Gender and Race in the United States; The Cultural Representations of Gender; Gender and Public Policy; Gender and Global Issues; Gender and Autobiography; The Body, Theory and Representation). Other clusters may be developed in consultation with a Women's Studies adviser.

Total units for the major

Major Adviser. See *Class Schedule and Room Directory*.

Minor Program Requirements:

	UNITS
Women's Studies	24
A. Core courses	4
Women's Studies 20, 50, 70 or 80	
B. Ethnic studies/Women of color in the U.S. (choose one)	4
African American Studies 123, Asian American Studies 112, Chicano Studies 102, Native American Studies 180, Sociology 134, Women's Studies 195.	
C. Culture outside the U.S.:	4
Anthropology 131, Classics 15, Comparative Literature 135, East Asian Studies 113, English 185A, 185B, German 129, History 102H, 102O, 148A, 148B, Sociology 145B, Women's Studies 102.	

Additional Electives from approved list of upper division cross-listed and Women's Studies courses.....12

Note: With prior consultation with an adviser, other upper division courses may be accepted toward the minor program. Under no circumstances may more than one lower division course be offered in satisfaction of requirements for the minor.

Graduate Study. The Women's Studies Program offers a Designated Emphasis in Feminist Theory and Research for students enrolled in the PH.D. programs of twelve other affiliated departments. Please see catalog listing "Feminist Theory and Research."

Courses in Women's Studies (WMS)

Lower Division Courses

20. Cultural Representations of Gender (4) I, II. Newton, Fregoso

Lecture/discussion—4 hours. Prerequisite: one course specified for the Women's Studies major. Interdisciplinary investigation of how specific cultures represent gender difference. Examine a variety of cultural forms and phenomena including film, television, literature, music, popular movements, and institutions.

50. Introduction to Women's Studies (4) I, II, III. Newton, Robnett, Fregoso

Lecture—3 hours; discussion—1 hour or term paper (instructor's option). Interdisciplinary introduction which will survey and integrate literary, anthropological, psychological, historical, sociological and biological perspectives on the study of sex roles. General Education credit: Contemporary Societies.

70. Theory and History of Sexualities (4) III. Newton

Lecture/discussion—4 hours. Key issues in the social construction, organization, and reproduction of sexualities such as the intersection of sexual identity with gender, race, ethnicity, and class, and the relation between movements for sexual liberation and the regulation of the body.

***80. Special Topics in Women's Studies** (4) II. Robnett

Lecture/discussion—4 hours. In-depth examination of a women's studies topic related to the research interest of the instructor. May be repeated for credit when topic differs. Limited enrollment.

98. Directed Group Study (1-5) I, II, III. The Staff (Director in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Director in charge)
(P/NP grading only.)

Upper Division Courses

102. Colonialism, Nationalism, and Women (4) III. Mani

Lecture/discussion—4 hours. Prerequisite: one course specified for Women's Studies major. Explores key dimensions of women's relationship to colonialism and nationalism in one or more societies.

103. Introduction to Feminist Theory (4) I. Ho

Lecture/discussion—4 hours. Prerequisite: one course specified for the Women's Studies major. Introduction to the emergence of feminist theory and to key concepts in feminist theorizing. Examination of past and current debates over sexuality, race, identity politics, and the social construction of women's experience.

104. Feminist Approaches to Inquiry (4) II. Newton

Lecture/discussion—4 hours. Prerequisite: one course specified for the Women's Studies major. Feminist applications and transformations of traditional disciplinary practices; current issues and methodologies in feminist interdisciplinary work.

***187. Gender and Social Policy** (4) III.

Lecture/discussion—3 hours; term paper. Prerequisite: upper division standing and a course in Women's

Studies. The role of gender in the creation of social policies, especially with respect to issues brought into the policy arena by contemporary feminism. Offered in alternate years.

190. Senior Seminar (4) II. Mani

Seminar—4 hours. Prerequisite: Women's Studies senior status. Capstone course for senior Women's Studies majors, which focuses on current issues on feminism as they impact on theory, public policy, and practice.

192. Internship in Women's Studies (1-12) I, II, III. The Staff

Internship—3-36 hours; written report. Prerequisite: completion of a minimum of 84 units and consent of instructor; enrollment dependent on availability of intern positions with priority to Women's Studies majors. Supervised internship and study in positions/institutional settings dealing with gender-related problems or issues, as for example, a women's center, affirmative action office, advertising agency, or social welfare agency. Final written report on internship experience. (P/NP grading only.)

195. Thematic Seminar in Women's Studies (4) I, II, III. The Staff

Seminar—4 hours. Prerequisite: two courses specified for women's studies major. Group study of a topic, issue or area in feminist theory and research involving intensive reading and writing. May be repeated for credit when topic differs. Enrollment limited.

197T. Tutoring in Women's Studies (1-4) I, II, III. The Staff (Director in charge)

Tutoring—3-12 hours. Prerequisite: upper division standing; completion of course to be tutored with grade of A- or better. Activities vary depending on the nature of the course assignment. May include (but not limited to) tutoring on course material, advising on projects and papers, leading discussion groups. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Director in charge)

Prerequisite: upper division standing; consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Director in charge)

Prerequisite: upper division standing; consent of instructor. (P/NP grading only.)

Graduate Courses

200A. Current Issues in Feminist Theory (4) II. Stacey

Seminar—4 hours. Current issues in feminist theory; techniques employed to build feminist theory in various fields.

200B. Problems in Feminist Research (4) III. Schiesari

Seminar—4 hours. Prerequisite: course 200A with a grade of B+ or better. Application of feminist theoretical perspectives to the interdisciplinary investigation of a problem or question chosen by the instructor(s). May be repeated for credit when subject area differs.

201. Special Topics in Feminist Theory and Research (4) III. Ericksen, Joffe

Lecture/discussion—4 hours. Explores in depth a topic in feminist theory and research related to the research interests of the instructor. May be repeated as often as desired for credit in different subject areas. Limited enrollment.

299. Special Study for Graduate Students (1-12) I, II, III. The Staff

(S/U grading only.)

Zoology

See Biological Sciences: Section of Evolution and Ecology

Concordance Lists for Sections in the Division of Biological Sciences

On July 1, 1993, the faculty and teaching programs of the six departments in the Division of Biological Sciences at UC Davis were reorganized into five new sections: Evolution and Ecology (EVE); Microbiology (MIC); Molecular and Cellular Biology (MCB); Neurobiology, Physiology and Behavior (NPB); and Plant Biology (PLB). On the following pages are lists of courses offered by the former departments, followed by their new names, numbers, and titles in the new sections, and lists of courses offered by the five new sections, followed by their former names, numbers, and titles. Duplicate credit cannot be earned for a course under the new numbering system if credit has been earned for the course it replaced; however, some exceptions are allowed. If you have questions about duplication of credit or about receiving credit for repeating courses, please consult the Undergraduate Academic Programs Office, Division of Biological Sciences, 66 Briggs Hall (916-752-0410).

Former Departments

Concordance List for Biochemistry and Biophysics (BCP)			
Former Number and Course Title		Equivalent New Course, If Any	
101A	General Biochemistry	Biological Sciences 102	Structure and Function of Biomolecules
101B	General Biochemistry	Biological Sciences 103	Bioenergetics and Metabolism
101L	General Biochemistry Laboratory	Molecular & Cellular Biol 120L	Biochemistry Laboratory
102L	Advanced Undergraduate Laboratory		
110L	General Biochemistry Laboratory		
111L	General Biochemistry Laboratory		
122	Plant Biochemistry	Molecular & Cellular Biol 126	Plant Biochemistry
123	An Introduction to Enzymology	Food Science & Technology 123	An Introduction to Enzymology
123L	Enzymology Laboratory	Food Science & Technology 123L	Enzymology Laboratory
133	Behavior and Analysis of Enzyme Systems	Molecular & Cellular Biol 123	Behavior and Analysis of Enzyme & Receptor Systems
143	Structure-Function Relations of Proteins	Molecular & Cellular Biol 122	Structure and Function of Proteins
153	Molecular Biology of Eukaryotic Cells	Molecular & Cellular Biol 121	Molecular Biology of Eukaryotic Cells
190	Undergraduate Seminar in Biochemistry	Molecular & Cellular Biol 138	Undergraduate Seminar in Biochemistry
192	Internship	Molecular & Cellular Biol 192	Internship
194H	Biochemistry Honors	Molecular & Cellular Biol 194H	Research Honors
197T	Tutoring in Biochemistry	Molecular & Cellular Biol 197T	Tutoring
198	Directed Group Study	Molecular & Cellular Biol 198	Directed Group Study
199	Special Study for Advanced Undergraduates	Molecular & Cellular Biol 199	Special Study for Advanced Undergraduates
200	Current Techniques in Biochemistry	Molecular & Cellular Biol 200B	Current Techniques in Biochemistry
201A	Physical and Chemical Biochemistry	Molecular & Cellular Biol 221A	Physical and Chemical Biochemistry
201B	Integration of Metabolism and Regulatory Phenomena	Molecular & Cellular Biol 221B	Integration of Metabolism and Regulatory Phenomena
201C	Molecular Biology	Molecular & Cellular Biol 221C	Molecular Biology
201D	Cellular Biochemistry	Molecular & Cellular Biol 221D	Cellular Biochemistry
202L	Advanced Biochemistry Laboratory	Molecular & Cellular Biol 220L	Advanced Biochemistry Laboratory Rotations
204	Gene Expression		
208	Membrane Biochemistry	Molecular & Cellular Biol 231	Membrane Biochemistry
212	Chemical Modifications of Proteins	Molecular & Cellular Biol 232	Chemical Modifications of Proteins
215	Kinetics of Biological Systems		
250	Biochemical Literature	Molecular & Cellular Biol 290C	Research Conference
270	Advanced Research Conference	Molecular & Cellular Biol 296	Research Seminar
291	Current Progress in Biochemistry	Molecular & Cellular Biol 291	Current Progress in Molecular and Cellular Biology
298	Group Study	Molecular & Cellular Biol 298	Group Study
299	Research	Molecular & Cellular Biol 299	Research
390	The Teaching of Biochemistry	Molecular & Cellular Biol 390	Methods of Teaching

Concordance List for Biological Sciences (BIS)			
Former Number and Course Title		Equivalent New Course, If Any	
121	Physiological Adaptation of Marine Organisms	NeuroPhysiol&Behavior 141	Physiological Adaptation of Marine Organisms
121P	Physiol. Adaptation Marine Organisms: Adv Lab	NeuroPhysiol&Behavior 141P	Physiol. Adaptation Marine Organisms: Adv Laboratory
XX, 1XX, 2XX	All other undergraduate and graduate courses	Biological Sciences XX, 1XX, 2XX	No change to existing courses or numbers.

See course listing for new upper division common curriculum (Biological Sciences 101, 102, 103, 104).

Concordance List for Botany (BOT)

Former Number and Course Title		Equivalent New Course, if Any	
XX	Lower division courses in Botany	Plant Biology XX	Lower division courses in Plant Biology
100	Evolutionary Biology of Plants	Evolution and Ecology 100	Introduction to Evolution
101	Survey of Plant Communities of California	Evolution and Ecology 121	former PLB 121 Survey of Plant Communities of Calif.
117	Plant Ecology	Evolution and Ecology 117/ Plant Biology 117	Plant Ecology
130	Survey of Cell Biology	Biological Sciences 104	Regulation of Cell Function
140	Paleobotany	Evolution and Ecology 140	Paleobotany
144	Plant Geography	Evolution and Ecology 144	Plant Geography
1XX	All other upper division Botany courses	Plant Biology 1XX	Upper division courses in Plant Biology
202	Plant Ecophysiology	Plant Biology (GradGp) 210	Plant Ecophysiology
203	Ecophysiological Methods	Plant Biology (GradGp) 211	Ecophysiological Methods
240	Paleobotany and Angiosperm Evolution	Evolution and Ecology 240	Paleobotany and Angiosperm Evolution
243	Palynology	Evolution and Ecology 243	Palynology
2XX	All other graduate Botany courses	Plant Biology (GradGp) 2XX	Graduate courses in Plant Biology
390	The Teaching of Botany	Plant Biology 390	The Teaching of Botany

Concordance List for Genetics (GEN)

Former Number and Course Title		Equivalent New Course, if Any	
10	Heredity and Evolution	Molecular & Cellular Biol 10	Introduction to Human Heredity
99	Special Study for Undergraduates	Molecular & Cellular Biol 99	Special Study
100	Principles of Genetics	Biological Sciences 101	Genes and Gene Expression
100L	Principles of Genetics Laboratory	Molecular & Cellular Biol 160L	Principles of Genetics Laboratory
102A 102B	Molecular Genetics Molecular Genetics	Molecular & Cellular Biol 161	Molecular Genetics
102L	Advanced Molecular Genetics Laboratory	Molecular & Cellular Biol 170L	Advanced Molecular Genetics Laboratory
103	Organic Evolution	Evolution and Ecology 100	Introduction to Evolution
104	Developmental Genetics	Molecular & Cellular Biol 163	Developmental Genetics
105 106	Population Genetics Evolutionary Quantitative Genetics	Evolution and Ecology 102	Advanced Evolution
107	Human Genetics	Molecular & Cellular Biol 162	Human Genetics
144	Advanced Developmental Genetics	Molecular & Cellular Biol 166	Advanced Developmental Genetics
190C	Introduction to Genetics Research	Molecular & Cellular Biol 190C	Undergraduate Research Conference
191	Undergraduate Seminar in Molecular Genetics	Molecular & Cellular Biol 178	Undergraduate Seminar in Molecular Genetics
192	Internship	Molecular & Cellular Biol 192	Internship
193	Research Seminar in Current Topics	Molecular & Cellular Biol 193	Advanced Research
197T	Tutoring in Genetics	Molecular & Cellular Biol 197T	Tutoring
198	Group Study	Molecular & Cellular Biol 198	Directed Group Study
199	Special Study for Advanced Undergraduates	Molecular & Cellular Biol 199	Special Study for Advanced Undergraduates
202	Plasmids, Recombinant DNA, and Genetic Engineering	Molecular & Cellular Biol 262	Recombinant DNA and Genetic Engineering
203	Advanced Evolution	Population Biology (Grad) 203	Advanced Evolution
205	Theoretical Population Genetics	Population Biology (Grad) 205	Theoretical Population Genetics
209	Molecular Evolution	Population Biology (Grad) 209	Molecular Evolution
290C	Research Conference in Genetics	Molecular & Cellular Biol 290C	Research Conference
298	Group Study	Molecular & Cellular Biol 298	Group Study
299	Research	Molecular & Cellular Biol 299	Research
300	Methods in Teaching Genetics	Molecular & Cellular Biol 390	Methods of Teaching

Concordance List for Microbiology (MIC)

Former Number and Course Title		Equivalent New Course, if Any	
XX, 1XX, 2XX	All undergraduate and graduate courses.	Microbiology XX, 1XX, 2XX	No change to existing courses or numbers.

Concordance List for Physiology—Animal (PHS)

Former Number and Course Title		Equivalent New Course, if Any	
2	Introductory Physiology		
2L	Introductory Physiology Laboratory		
10	Elementary Physiology	NeuroPhysiol&Behavior 10	Elementary Physiology
100A	Cellular Physiology	Biological Sciences 104	Regulation of Cell Function
100B	Cellular Physiology	NeuroPhysiol&Behavior 103	former NPB 100B Cellular Physiology/Neurobiology
100L	Cellular Physiology Laboratory	NeuroPhysiol&Behavior 104L	former NPB 100L Cellular Physiology/Neurobiol Lab
106A 106B	Experiments in Physiology: Design and Execution Experiments in Physiology: Design and Execution	NeuroPhysiol&Behavior 106	Experiments in Physiology: Design and Execution
110	Systemic Physiology	NeuroPhysiol&Behavior 101	former NPB 110 Systemic Physiology
110L	Systemic Physiology Laboratory	NeuroPhysiol&Behavior 101L	former NPB 110L Systemic Physiology Laboratory
120A	Comparative Physiology: Neurointegrative Mech	NeuroPhysiol&Behavior 125	former NPB 120A Compar. Physiol. Neurointeg Mech
120B	Comparative Physiology: Circulation	NeuroPhysiol&Behavior 127	former NPB 120B Compar. Physiol: Circulation
120D	Comparative Physiology: Endocrinology	NeuroPhysiol&Behavior 128	former NPB 120D Compar. Physiol: Endocrinology
120E	Comparative Physiology: Respiration	NeuroPhysiol&Behavior 129	former NPB 120E Compar. Physiol: Respiration
120F	Comparative Physiology of Sensory Systems	NeuroPhysiol&Behavior 126	former NPB 120F Compar. Physiol. of Sensory Sys
147	Aviation Physiology		
148	Principles of Environmental Physiology	NeuroPhysiol&Behavior 140	former NPB 148 Principles of Environmental Physiol.
1XX	All other undergraduate Physiology courses	NeuroPhysiol&Behavior 1XX	Undergraduate courses in Neurobiology, Physiology and Behavior
2XX	Graduate courses in Physiology	Physiology (Grad) 2XX	Graduate courses in the Physiology Graduate Group
3XX	Professional courses in Physiology	Physiology (Grad) 3XX	Professional courses in the Physiology Graduate Grp

Concordance List for Zoology (ZOO)

Former Number and Course Title		Equivalent New Course, if Any	
10	Concepts of Zoology		
92	Internship	Evolution and Ecology 92	Internship
99	Special Study for Lower Division Students	Evolution and Ecology 99	Special Study for Lower Division Students
100	Embryology	Molecular & Cellular Biol 150	Embryology
100L	Laboratory in Vertebrate Embryology	Molecular & Cellular Biol 150L	Laboratory in Vertebrate Embryology
101	Advanced Developmental Biology	Molecular & Cellular Biol 151	Advanced Developmental Biology
102	Senior Colloquium in Developmental Biology	Molecular & Cellular Biol 159	Senior Colloquium in Developmental Biology
105	Phylogenetic Analysis of Vertebrate Structure	Evolution and Ecology 105	Phylogenetic Analysis of Vertebrate Structure
112	Invertebrate Zoology	Evolution and Ecology 112	Invertebrate Zoology
112L	Laboratory for Invertebrate Zoology	Evolution and Ecology 112L	Laboratory for Invertebrate Zoology
121A	Cell Biology	Biological Sciences 104	Regulation of Cell Function
121B	Cell Biology	Molecular & Cellular Biol 141	Cellular Regulation of Gene Expression
121C	Advanced Cell Biology	Molecular & Cellular Biol 142	Advanced Cell Biology: Contractile and Motile Systems
121L	Cell Biology Laboratory	Molecular & Cellular Biol 140L	Cell Biology Laboratory
122	Histology	Molecular & Cellular Biol 146	Histology
125	Animal Ecology	Evolution and Ecology 101	Introduction to Ecology
130	Survey of Cell Biology	Biological Sciences 104	Regulation of Cell Function
133	Patterns in Vertebrate Biology	Evolution and Ecology 133	Patterns in Vertebrate Biology
134	Herpetology	Evolution and Ecology 134	Herpetology
134L	Herpetology Laboratory	Evolution and Ecology 134L	Herpetology Laboratory
136	Mammalogy	Evolution and Ecology 136	Mammalogy
136L	Mammalogy Laboratory	Evolution and Ecology 136L	Mammalogy Laboratory
137	Ornithology	Evolution and Ecology 137	Ornithology
137L	Ornithology Laboratory	Evolution and Ecology 137L	Ornithology Laboratory
138	Ecology of Tropical Latitudes	Evolution and Ecology 138	Ecology of Tropical Latitudes
141	Principles of Systematic Zoology	Evolution and Ecology 141	Principles of Systematic Zoology
142	Invertebrate Physiology	NeuroPhysiol&Behavior 119	former NPB 142 Invertebrate Physiology
142L	Invertebrate Physiology Laboratory	NeuroPhysiol&Behavior 119L	former NPB 142L Invertebrate Physiology Laboratory

Concordance List for Zoology (ZOO) continued

Former Number and Course Title		Equivalent New Course, If Any	
143	Neurobiology	NeuroPhysiol&Behavior 160	former NPB 143 Advanced Cellular Neurobiology
143L	Neurobiology Laboratory	NeuroPhysiol&Behavior 160L	former NPB 143L Advanced Cellular Neurobiol. Lab
147	Zoogeography	Evolution and Ecology 147	Zoogeography
148	Animal Phylogeny and Evolution	Evolution and Ecology 100	Introduction to Evolution
149	Evolution of Ecological Systems	Evolution and Ecology 149	Evolution of Ecological Systems
155	Behavior of Animals	NeuroPhysiol&Behavior 102	former NPB 155 Animal Behavior
170	Comparative Biomechanics	Evolution and Ecology 170	Comparative Biomechanics
170L	Comparative Biomechanics Laboratory	Evolution and Ecology 170L	Comparative Biomechanics Laboratory
189	Introduction to Biological Research	Evolution and Ecology 189	Introduction to Research
190	Undergraduate Seminar in Zoology	Evolution and Ecology 190	Undergraduate Seminar in Evolution and Ecology
192	Internship	Evolution and Ecology 192	Internship
194H	Research Honors in Zoology	Evolution and Ecology 194H	Research Honors
197T	Tutoring in Zoology	Evolution and Ecology 197T	Tutoring
198	Directed Group Study	Evolution and Ecology 198	Directed Group Study
199	Special Study for Advanced Undergraduates	Evolution and Ecology 199	Special Study for Advanced Undergraduates
200	Current Techniques in Cell Biology	Molecular & Cellular Biol 200A	Current Techniques in Cell Biology
200LA	Cell and Developmental Biology Laboratory	Cell&Devel Biology 200LA	Cell and Developmental Biology Laboratory
200LB	Cell and Developmental Biology Laboratory	Cell&Devel Biology 200LB	Cell and Developmental Biology Laboratory
202	Biomathematics		
203	Global and Regional Modeling		
204	Cellular Basis of Morphogenesis	Molecular & Cellular Biol 252	Cellular Basis of Morphogenesis
205	Pattern Formation	Molecular & Cellular Biol 253	Pattern Formation
206	Mechanisms of Organogenesis	Molecular & Cellular Biol 254	Mechanisms of Organogenesis
208	Molecular Mechanisms in Animal Development	Molecular & Cellular Biol 255	Molecular Mechanisms in Animal Development
212	Topics in Invertebrate Evolution	Population Biology (Grad) 212	Topics in Invertebrate Evolution
221	Behavioral Ecology	Evolution and Ecology 221	Behavioral Ecology
223	Modeling in Behavioral and Evolutionary Ecology	Population Biology (Grad) 223	Modeling in Behavioral and Evolutionary Ecology
225	Biology of Fertilization	Molecular & Cellular Biol 251	Biology of Fertilization
226	Cell and Molecular Biology of Cancer	Molecular & Cellular Biol 256	Cell and Molecular Biology of Cancer
236	Muscle Physiology	Molecular & Cellular Biol 242	Muscle Biophysics
240	Topics in Cell Biology	Molecular & Cellular Biol 250	Special Topics in Cell Biology
241	Membrane Biology	Molecular & Cellular Biol 241	Membrane Biology
242	Research Conference in Cell Biology	Molecular & Cellular Biol 249	Literature in Cell Biology
243	Topics in Cellular and Behavioral Neurobiology	Neuroscience 243	Topics in Cellular and Behavioral Neurobiology
254	Ecology of Parasites		
266	Seminar in Cell Biology	Molecular & Cellular Biol 248	Seminar in Cell Biology
269	Research Conference in Developmental Biology	Molecular & Cellular Biol 259	Literature in Developmental Biology
270	Research Conference in Evolutionary Biology	Population Biology (Grad) 270	Research Conference in Evolutionary Biology
283	Neurobiological Literature	Neurobiology 283	Neurobiological Literature
287	Seminar in Animal Behavior	Evolution and Ecology 287	Seminar in Animal Behavior
290	Current Topics in Zoology	Evolution and Ecology 290	Current Topics
290C	Research Conference in Zoology	Evolution and Ecology 290C	Research Conference
292	Seminar in Development	Molecular & Cellular Biol 258	Seminar in Development
294	Seminar in Animal Ecology	Evolution and Ecology 294	Seminar in Animal Ecology
296	Seminar in Geographical Ecology	Population Biology (Grad) 296	Seminar in Geographical Ecology
298	Group Study	Evolution and Ecology 298	Group Study
299	Research	Evolution and Ecology 299	Research
390	Methods of Teaching Zoology	Evolution and Ecology 390	Methods of Teaching

New Sections**Concordance List for Biological Sciences (BIS)**

New Number and Course Title		Equivalent Former Course, if Any	
101	Genes and Gene Expression	Genetics 100	Principles of Genetics
102	Structure and Function of Biomolecules	Biochem & Biophys 101A	General Biochemistry
103	Bioenergetics and Metabolism	Biochem & Biophys 101B	General Biochemistry
104	Regulation of Cell Function	Botany/Zoology 130 Physiology 100A Zoology 121A	Survey of Cell Biology Cellular Physiology Cell Biology
XX, 1XX, 2XX	All other undergraduate and graduate courses	Biological Sciences XX, 1XX, 2XX	No change to existing courses or numbers.

Concordance List for Evolution and Ecology (EVE)

New Number and Course Title		Equivalent Former Course, if Any	
92	Internship	Zoology 92	Internship
99	Special Study for Lower Division Students	Zoology 99	Special Study for Lower Division Students
100	Introduction to Evolution	Botany 100 Genetics 103 Zoology 148	Evolutionary Biology of Plants Organic Evolution Animal Phylogeny and Evolution
101	Introduction to Ecology	Zoology 125	Animal Ecology
102	Advanced Evolution	Genetics 105 Genetics 106	Population Genetics Evolutionary Quantitative Genetics
105	Phylogenetic Analysis of Vertebrate Structure	Zoology 105	Phylogenetic Analysis of Vertebrate Structure
112	Invertebrate Zoology	Zoology 112	Invertebrate Zoology
112L	Laboratory for Invertebrate Zoology	Zoology 112L	Laboratory for Invertebrate Zoology
117	Plant Ecology (Same course as Plant Biology 117)	Botany 117	Plant Ecology
121	Survey of Plant Communities in California	Plant Biology 121	former BOT 101 Survey of Plant Communities in Calif
133	Patterns in Vertebrate Biology	Zoology 133	Patterns in Vertebrate Biology
134	Herpetology	Zoology 134	Herpetology
134L	Herpetology Laboratory	Zoology 134L	Herpetology Laboratory
136	Mammalogy	Zoology 136	Mammalogy
136L	Mammalogy Laboratory	Zoology 136L	Mammalogy Laboratory
137	Ornithology	Zoology 137	Ornithology
137L	Ornithology Laboratory	Zoology 137L	Ornithology Laboratory
138	Ecology of Tropical Latitudes	Zoology 138	Ecology of Tropical Latitudes
140	Paleobotany	Botany 140	Paleobotany
141	Principles of Systematic Zoology	Zoology 141	Principles of Systematic Zoology
144	Plant Geography	Botany 144	Plant Geography
147	Zoogeography	Zoology 147	Zoogeography
149	Evolution of Ecological Systems	Zoology 149	Evolution of Ecological Systems
170	Comparative Biomechanics	Zoology 170	Comparative Biomechanics
170L	Comparative Biomechanics Laboratory	Zoology 170L	Comparative Biomechanics Laboratory
189	Introduction to Research	Zoology 189	Introduction to Biological Research
190	Undergraduate Seminar	Zoology 190	Undergraduate Seminar in Zoology
192	Internship	Zoology 192	Internship
194HABC	Research Honors	Zoology 194HABC	Research Honors in Zoology
197T	Tutoring	Zoology 197T	Tutoring in Zoology
198	Directed Group Study	Zoology 198	Directed Group Study
199	Special Study for Advanced Undergraduates	Zoology 199	Special Study for Advanced Undergraduates
221	Behavioral Ecology	Zoology 221	Behavioral Ecology
240	Paleobotany and Angiosperm Evolution	Botany 240	Paleobotany and Angiosperm Evolution
243	Palynology	Botany 243	Palynology
287	Seminar in Animal Behavior	Zoology 287	Seminar in Animal Behavior
290	Current Topics	Zoology 290	Current Topics in Zoology
290C	Research Conference	Zoology 290C	Research Conference in Zoology
294	Seminar in Animal Ecology	Zoology 294	Seminar in Animal Ecology
298	Group Study	Zoology 298	Group Study
299	Research	Zoology 299	Research
390	Methods of Teaching	Zoology 390	Methods of Teaching Zoology

Concordance List for Molecular and Cellular Biology (MCB)

New Number and Course Title		Equivalent Former Course, If Any	
10	Introduction to Human Heredity	Genetics 10	Heredity and Evolution
99	Special Study	Genetics 99	Special Study for Undergraduates
120L	Biochemistry Laboratory	Biochem & Biophys 101L	General Biochemistry Laboratory
121	Molecular Biology of Eukaryotic Cells	Biochem & Biophys 153	Molecular Biology of Eukaryotic Cells
122	Structure and Function of Proteins	Biochem & Biophys 143	Structure-Function Relations of Proteins
123	Behavior and Analysis of Enzyme & Receptor Systems	Biochem & Biophys 133	Behavior and Analysis of Enzyme Systems
126	Plant Biochemistry	Biochem & Biophys 122	Plant Biochemistry
138	Undergraduate Seminar in Biochemistry	Biochem & Biophys 190	Undergraduate Seminar in Biochemistry
140L	Cell Biology Laboratory	Zoology 121L	Cell Biology Laboratory
141	Cellular Regulation of Gene Expression	Zoology 121B	Cell Biology
142	Advanced Cell Biology: Contractile and Motile Systems	Zoology 121C	Advanced Cell Biology
146	Histology	Zoology 122	Histology
148	Undergraduate Seminar in Cell Biology		
150	Embryology	Zoology 100	Embryology
150L	Laboratory in Vertebrate Embryology	Zoology 100L	Laboratory in Vertebrate Embryology
151	Advanced Developmental Biology	Zoology 101	Advanced Developmental Biology
158	Undergraduate Seminar in Developmental Biology		
159	Senior Colloquium in Developmental Biology	Zoology 102	Senior Colloquium in Developmental Biology
160L	Principles of Genetics Laboratory	Genetics 100L	Principles of Genetics Laboratory
161	Molecular Genetics	Genetics 102A	Molecular Genetics
162	Human Genetics	Genetics 107	Human Genetics
163	Developmental Genetics	Genetics 104	Developmental Genetics
164	Chromosome Structure and Function		
166	Advanced Developmental Genetics	Genetics 144	Advanced Developmental Genetics
170L	Advanced Molecular Genetics Laboratory	Genetics 102L	Advanced Molecular Genetics Laboratory
178	Undergraduate Seminar in Molecular Genetics	Genetics 191	Undergraduate Seminar in Molecular Genetics
190C	Undergraduate Research Conference	Genetics 190C	Introduction to Genetics Research
191	Introduction to Research		
192	Internship	Biochem & Biophys 192 Genetics 192	Internship Internship
193	Advanced Research	Genetics 193	Research Seminar in Current Topics
194H	Research Honors	Biochem & Biophys 194H	Biochemistry Honors
197T	Tutoring	Biochem & Biophys 197T Genetics 197T	Tutoring in Biochemistry Tutoring in Genetics
198	Directed Group Study	Biochem & Biophys 198 Genetics 198	Directed Group Study Group Study
199	Special Study for Advanced Undergraduates	Biochem & Biophys 199 Genetics 199	Special Study for Advanced Undergraduates Special Study for Advanced Undergraduates
200A	Current Techniques in Cell Biology	Zoology 200	Current Techniques in Cell Biology
200B	Current Techniques in Biochemistry	Biochem & Biophys 200	Current Techniques in Biochemistry
200C	Current Techniques in Biophysics (same course as Biophysics 200)	Biophysics (Grad) 200	Current Techniques in Biophysics (same course as Molecular & Cellular Biology 200C)
220L	Advanced Biochemistry Laboratory Rotations	Biochem & Biophys 202L	Advanced Biochemistry Laboratory
221A	Physical and Chemical Biochemistry	Biochem & Biophys 201A	Physical and Chemical Biochemistry
221B	Integration of Metabolism and Regulatory Phenomena	Biochem & Biophys 201B	Integration of Metabolism and Regulatory Phenomena
221C	Molecular Biology	Biochem & Biophys 201C	Molecular Biology
221D	Cellular Biochemistry	Biochem & Biophys 201D	Cellular Biochemistry
231	Membrane Biochemistry	Biochem & Biophys 208	Membrane Biochemistry
232	Chemical Modifications of Proteins	Biochem & Biophys 212	Chemical Modifications of Proteins
241	Membrane Biology	Zoology 241	Membrane Biology
242	Muscle Biophysics	Zoology 236	Muscle Physiology
248	Seminar in Cell Biology	Zoology 266	Seminar in Cell Biology
249	Literature in Cell Biology	Zoology 242	Research Conference in Cell Biology
250	Special Topics in Cell Biology	Zoology 240	Topics in Cell Biology
251	Biology of Fertilization	Zoology 225	Biology of Fertilization
252	Cellular Basis of Morphogenesis	Zoology 204	Cellular Basis of Morphogenesis

Concordance List for Molecular and Cellular Biology (MCB) continued

New Number and Course Title		Equivalent Former Course, if Any	
253	Pattern Formation	Zoology 205	Pattern Formation
254	Mechanisms of Organogenesis	Zoology 206	Mechanisms of Organogenesis
255	Molecular Mechanisms in Animal Development	Zoology 208	Molecular Mechanisms in Animal Development
256	Cell and Molecular Biology of Cancer	Zoology 226	Cell and Molecular Biology of Cancer
258	Seminar in Development	Zoology 292	Seminar in Development
259	Literature in Developmental Biology	Zoology 269	Research Conference in Developmental Biology
262	Recombinant DNA and Genetic Engineering	Genetics 202	Plasmids, Recombinant DNA, and Genetic Engineering
290C	Research Conference	Biochem & Biophys 250 Genetics 290C	Biochemical Literature Research Conference in Genetics
291	Current Progress in Molecular and Cellular Biology	Biochem & Biophys 291	Current Progress in Biochemistry
295	Literature in Molecular and Cellular Biology		
296	Research Seminar	Biochem & Biophys 270	Advanced Research Conference
298	Group Study	Biochem & Biophys 298 Genetics 298	Group Study Group Study
299	Research	Biochem & Biophys 299 Genetics 299	Research Research
390	Methods of Teaching	Biochem & Biophys 390 Genetics 300	The Teaching of Biochemistry Methods in Teaching Genetics

Concordance List for Microbiology (MIC)

New Number and Course Title		Equivalent Former Course, if Any	
XX, 1XX, 2XX	Undergraduate and graduate courses in Microbiology	Microbiology XX, 1XX, 2XX	No change to existing courses or numbers

Concordance List for Neurobiology, Physiology and Behavior (NPB)

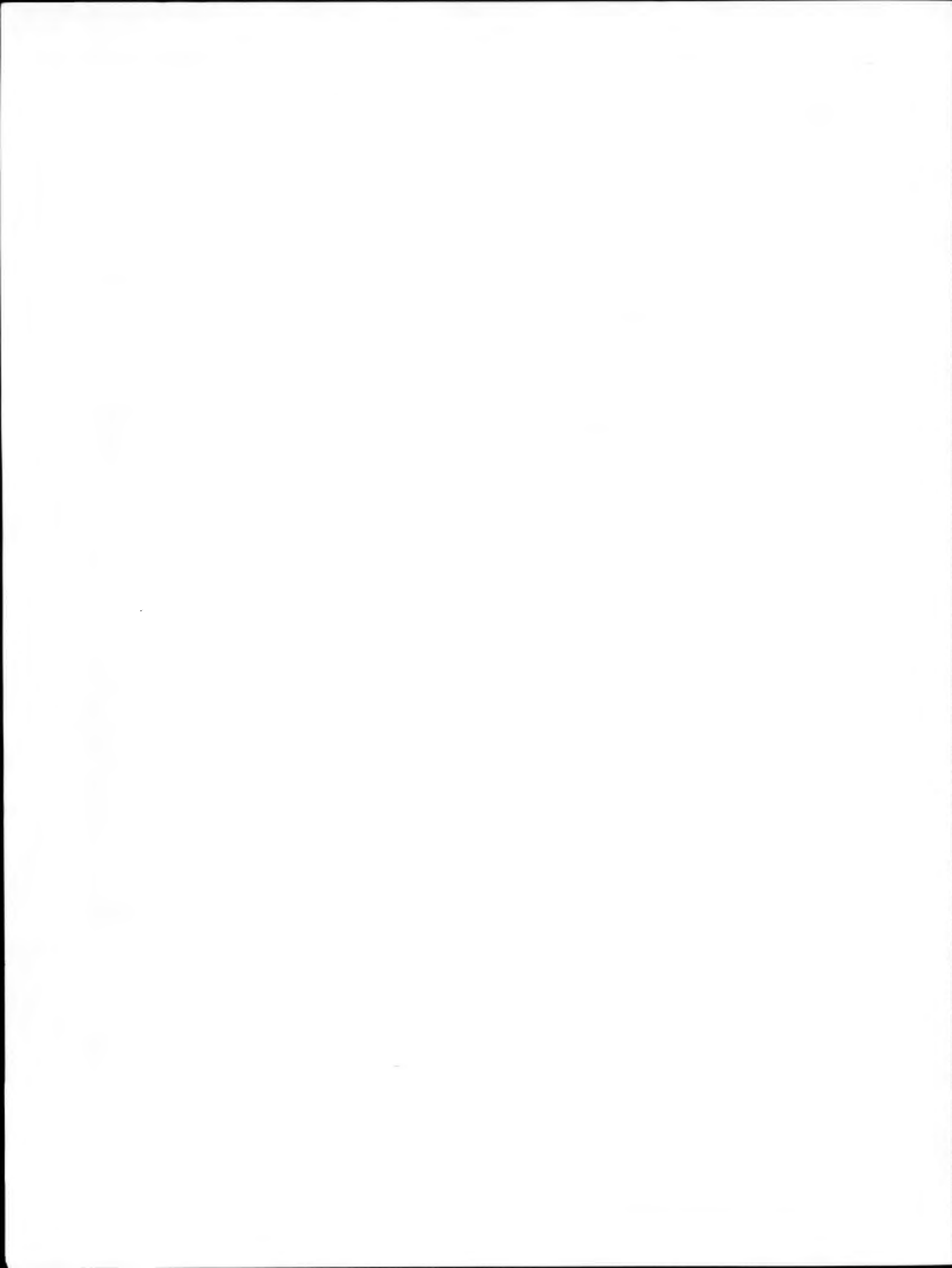
New Number and Course Title		Equivalent Former Course, if Any	
10	Elementary Physiology	Physiology 10	Elementary Physiology
101	former NPB 110 Systemic Physiology	Physiology 110	Systemic Physiology
101L	former NPB 110L Systemic Physiology Laboratory	Physiology 110L	Systemic Physiology Laboratory
102	former NPB 155 Animal Behavior	Zoology 155	Behavior of Animals
103	former NPB 100B Cellular Physiology/Neurobiology	Physiology 100B	Cellular Physiology
104L	former NPB 100L Cellular Physiology/Neurobiology Lab	Physiology 100L	Cellular Physiology Laboratory
106	Experiments in Physiology: Design and Execution	Physiology 106A Physiology 106B	Experiments in Physiology: Design and Execution Experiments in Physiology: Design and Execution
111ABC	Advanced Systemic Physiology Laboratory	Physiology 111ABC	Advanced Systemic Physiology Laboratory
112	Neuroscience	Physiology 112	Neuroscience
113	Cardiovascular, Respiratory, and Renal Physiology	Physiology 113	Cardiovascular, Respiratory, and Renal Physiology
114	Gastrointestinal Physiology	Physiology 114	Gastrointestinal Physiology
117	Avian Physiology	Physiology 117	Avian Physiology
119	former NPB 142 Invertebrate Physiology	Zoology 142	Invertebrate Physiology
119L	former NPB142L Invertebrate Physiology Laboratory	Zoology 142L	Invertebrate Physiology Laboratory
121	Physiology of Reproduction	Physiology 121	Physiology of Reproduction
121L	Physiology of Reproduction Laboratory	Physiology 121L	Physiology of Reproduction Laboratory
125	former NPB 120A Compar. Physiol: Neurointeg. Mech.	Physiology 120A	Comparative Physiology: Neurointegrative Mechanisms
126	former NPB 120F Comparative Physiol: Sensory Systems	Physiology 120F	Comparative Physiology of Sensory Systems
127	former NPB 120B Comparative Physiol: Circulation	Physiology 120B	Comparative Physiology: Circulation
128	former NPB 120D Comparative Physiol: Endocrinology	Physiology 120D	Comparative Physiology: Endocrinology
129	former NPB 120E Comparative Physiology: Respiration	Physiology 120E	Comparative Physiology: Respiration
130	Physiology of the Endocrine Glands	Physiology 130	Physiology of the Endocrine Glands
140	former NPB 148 Principles of Environmental Physiology	Physiology 148	Principles of Environmental Physiology
141	Physiological Adaptations of Marine Organisms	Biological Sciences 121	Physiological Adaptations of Marine Organisms
141P	Physiol Adaptations Marine Organisms: Advanced Lab	Biological Sciences 121P	Physiol. Adapt. Marine Organisms: Advanced Lab

Concordance List for Neurobiology, Physiology and Behavior (NPB) continued

New Number and Course Title	Equivalent Former Course, If Any
150 Hormones and Behavior	
160 former NPB 143 Advanced Cellular Neurobiology	Zoology 143 Neurobiology
160L former NPB 143L Advanced Cellular Neurobiology Lab	Zoology 143L Neurobiology Laboratory
161 Developmental Neurobiology	
162 Neuroethology	
190 Proseminar in Physiology	Physiology 190 Proseminar in Physiology
190C Introduction to Physiological Research	Physiology 190C Introduction to Physiological Research
192 Internship	Physiology 192 Internship
194HABC Physiology—Honors	Physiology 194HABC Physiology—Honors
196AB Voluntary Control of Physiological Processes	Physiology 196AB Voluntary Control of Physiological Processes
197T Tutoring in Physiology	Physiology 197T Tutoring in Physiology
198 Directed Group Study	Physiology 198 Directed Group Study
199 Special Study for Advanced Undergraduates	Physiology 199 Special Study for Advanced Undergraduates

Concordance List for Plant Biology (PLB)

New Number and Course Title	Equivalent Former Course, If Any
10 Plants, People and the Biosphere	Botany 10 Plants, People and the Biosphere
92 Internship	Botany 92 Internship
98 Directed Group Study	Botany 98 Directed Group Study
99 Special Study for Undergraduates	Botany 98 Special Study for Undergraduates
101 <i>See: Evolution and Ecology 121</i>	Plant Biology 101 former BOT 101 Survey of Plant Communities of Calif.
102 California Floristics	Botany 102 California Floristics
105 Developmental Plant Anatomy	Botany 105 Developmental Plant Anatomy
108 Systematic Botany of Flowering Plants	Botany 108 Systematic Botany of Flowering Plants
111 Plant Physiology	Botany 111 Plant Physiology
111D Problems in Plant Physiology	Botany 111D Problems in Plant Physiology
111L Introductory Plant Physiology Laboratory	Botany 111L Introductory Plant Physiology Laboratory
112 Plant Growth and Development	Botany 112 Plant Growth and Development
112D Problems in Plant Growth and Development	Botany 112D Problems in Plant Growth and Development
116 Plant Development and Evolution	Botany 116 Plant Development and Evolution
117 Plant Ecology (same course as Evolution and Ecology 117)	Botany 117 Plant Ecology
118 Introduction to Phycology	Botany 118 Introduction to Phycology
119 Introduction to Mycology	Botany 119 Introduction to Mycology
120 Introduction to Weed Science	Botany 120 Introduction to Weed Science
121 Biology of Weeds	Botany 121 Biology of Weeds
122 Action of Herbicides	Botany 122 Action of Herbicides
125 Molecular Biology of Plant Development	Botany 125 Molecular Biology of Plant Development
135 Mineral Nutrition of Plants	Botany 135 Mineral Nutrition of Plants
150 Biology and Management of Freshwater Macrophytes	Botany 150 Biology and Management of Freshwater Macrophytes
155 Anatomical and Cytological Methods	Botany 155 Anatomical and Cytological Methods
189 Experiments in Plant Biology: Design and Execution	
190C Research Conference in Botany	Botany 190C Research Conference in Botany
192 Internship	Botany 192 Internship
194H Special Study for Honors Students	Botany 194H Special Study for Honors Students
197T Tutoring in Botany	Botany 197T Tutoring in Botany
198 Directed Group Study	Botany 198 Directed Group Study
199 Special Study for Advanced Undergraduates	Botany 199 Special Study for Advanced Undergraduates



RESIDENCE FOR TUITION INFORMATION

Tuition Fee for Nonresident Students

If you have not been living in California with intent to make it your permanent home for more than one year immediately before the residence determination date for each term in which you propose to attend the University, you must pay a nonresident tuition fee in addition to all other fees. The residence determination date is the day instruction begins at the last of the University of California campuses to open for the quarter, and for schools on the semester system, the day instruction begins for the semester.

Law Governing Residence

The rules regarding residence for tuition purposes at the University of California are governed by the California Education Code and implemented by Standing Orders of the Regents of the University of California. Under these rules, adult citizens and certain classes of aliens can establish residence for tuition purposes. There are particular rules that apply to the residence classification of minors (see below).

Who is a Resident?

If you are an adult student (at least 18 years of age) you may establish residence for tuition purposes in California if: (1) you are a U.S. citizen; (2) you are a permanent resident or other immigrant; or (3) you are a nonimmigrant who is not precluded from establishing a domicile in the U.S. Nonimmigrants who are not precluded from establishing a domicile in the U.S. include those who hold visas of the following types: A, E, G, H-1, H-4, I, K, L, O-1, O-3, or R. To establish residence you must be physically present in California for more than one year and you must have come here with the intent to make California your home as opposed to coming to this state to go to school. Physical presence within the state solely for educational purposes does not constitute the establishment of California residence, regardless of the length of your stay. You must demonstrate your intention to make California your home by severing your residential ties with your former state of residence and establishing those ties with California. Evidence of intent must be dated one year before the term for which you seek resident classification. If these steps are delayed, the one-year durational period will be extended until you have demonstrated both presence and intent for one full year. Effective Fall 1993, if your parents are not residents of California or you were not previously enrolled as a UC student, you will be required to be financially independent in order to be a resident for tuition purposes. Your residence cannot be derived from your spouse or your parents.

Requirement for Financial Independence

You will be considered "financially independent" if one or more of the following applies: (1) you are at least 24 years of age by December 31 of the calendar year for which you are requesting residence classification; (2) you are a veteran of the U.S. Armed Forces; (3) you are a ward of the court or both parents are deceased; (4) you have legal dependents other than a spouse; (5) you are married, or a graduate student or a professional student, and you were not claimed as an income tax deduction by your parents or any other individual for the tax year immediately preceding the term for which you are requesting resident classification; or (6) you are a single undergraduate student and you were not claimed as an income tax deduction by your parents or any other individual for the two tax years immediately preceding the term for which you are requesting resident classification, and you can demonstrate self-sufficiency for those years and the current year. (Note: Financial dependence will not be a factor in residence status for graduate student instructors, graduate student teaching assistants, research assistants, junior specialists, post-graduate researchers, graduate student researchers, and teaching associates who are employed 49% or more of full time for the term for which classification is sought.)

Establishing Intent to Become a California Resident

Indications of your intent to make California your permanent residence can include the following: registering to vote and voting in California elections; designating California as your permanent address on all school and employment records, including military records if you are in the military service; obtaining a California driver's license or, if you do not drive, a California Identification Card; obtaining California vehicle registration; paying California income taxes as a resident, including taxes on income earned outside California from the date you establish residence; establishing a California residence in which you keep your personal belongings; and licensing for professional practice in California. The absence of these indications in other states during any period for which you claim residence can also serve as an indication of your intent. Documentary evidence is required and all relevant indications will be considered in determining your classification. **Your intent will be questioned if you return to your prior state of residence when the University is not in session.**

General Rules Applying to Minors

If you are an unmarried minor (under age 18), the residence of the parent with whom you live is considered to be your residence. If you have a parent living, you cannot change your residence by your own act, by the appointment of a legal guardian, or by the relinquishment of your parent's right of control. If you lived with neither parent, your residence is that of the parent with whom you last lived. Unless you are a minor alien present in the U.S. under the terms of a nonimmigrant visa which precludes you from establishing domicile in the U.S., you may establish your own residence when both your parents are deceased and a legal guardian has not been appointed. If you derive California residence from a parent, that parent must satisfy the one-year durational residence requirement.

Specific Rules Applying to Minors

1. Divorced/Separated Parents

You may be able to derive California resident status from a California resident parent if you move to California to live with that parent on or before your 18th birthday. If you begin residing with your California parent after your 18th birthday, you will be treated like any other adult student coming to California to establish residence.

2. Parent of Minor Moves From California

You may be entitled to resident status if you are a minor U.S. citizen or eligible alien whose parent(s) was a resident of California who left that state within one year of the residence determination date if: 1) you remained in California after your parent(s) departed; 2) you enroll in a California public postsecondary institution within one year of your parent(s) departure; and 3) once enrolled, you maintain continuous attendance in that institution.

3. Self-Support

You may be entitled to resident status if you are a U.S. citizen or eligible alien and either a minor or age 18 and can prove the following: 1) you lived in California for the entire year immediately preceding the residence determination date; 2) you have been self-supporting for that year; and 3) you intend to make California your permanent home.

4. Two-Year Care and Control

You may be entitled to resident status if you are a U.S. citizen or eligible alien and you have lived continuously with an adult who is not your parent for at least two years prior to the residence determination date. The adult with whom you are living must have been responsible for your care and control for the entire two-year period and must have been residing in California during the one year immediately preceding the residence determination date.

Exemptions from Nonresident Tuition

1. Member of the Military

If you are a member of the U.S. military stationed in California on active duty, unless you are assigned for educational pur-

poses to a state-supported institution of higher education, you may be exempt from the nonresident tuition fee until you have lived in California long enough to become a resident. You must provide the residence deputy on campus with a statement from your commanding officer or personnel officer stating that your assignment to active duty in California is not for educational purposes. The letter must include the dates of your assignment to the state.

2. Spouse or Other Dependents of Military Personnel

You are exempt from payment of the nonresident tuition fee if you are a spouse or a natural or adopted child or stepchild who is a dependent of a member of the U.S. military stationed in California on active duty. The exemption is available until you have lived in California long enough to become a resident. You must petition for a waiver of the nonresident tuition fee each term you are eligible. If you are enrolled in an educational institution and the member of the military is transferred on military orders to a place outside California where he or she continues to serve in the armed forces, or the member of the military retires from active duty immediately after having served in California on active duty, you may retain this exemption under the conditions listed above.

3. Child or Spouse of Faculty Member

To the extent funds are available, if you are an unmarried dependent child under age 21 or the spouse of a member of the University faculty who is a member of the Academic Senate, you may be eligible for a waiver of the nonresident tuition fee. Confirmation of the faculty member's membership on the Academic Senate must be secured each term this waiver is granted.

4. Child or Spouse of University Employee

You may be entitled to resident classification if you are the unmarried dependent child or the spouse of a full-time University employee whose assignment is outside of California (e.g., Los Alamos Scientific Laboratory). Your parent's or spouse's employment status with the University must be ascertained each term.

5. Child of Deceased Public Law Enforcement or Fire Suppression Employee

You may be entitled to a waiver of the nonresident tuition fee if you are the child of a deceased public law enforcement or fire-suppression employee who was a California resident at the time of his or her death and who was killed in the course of fire suppression or law enforcement duties.

6. Dependent of a California Resident

A student who has not been an adult resident of California for more than one year and who is the dependent child of a California resident who has been a resident for more than one year immediately prior to the residence determination date may be entitled to resident classification until the student has resided in California for the minimum time necessary to become a resident so long as continuous attendance is maintained at an institution.

7. Native American Graduate of BIA School

A student who is a graduate of a California school operated by the Federal Bureau of Indian Affairs (BIA), i.e., Sherman Indian High School, and who enrolls at the University of California may be eligible for an exemption of the nonresident fee.

Temporary Absence

If you are a nonresident student who is in the process of establishing a residence for tuition purposes and you return to your former home during non-instructional periods, your presence in the state will be presumed to be solely for educational purposes and only convincing evidence to the contrary will rebut this presumption. **(A student who is in the state solely for educational purposes will NOT be classified as a resident for tuition purposes regardless of the length of his or her stay.)** If you are a student who has been classified as a resident for tuition purposes and you leave the state temporarily, your absence could result in the loss of your California residence. The burden will be on you (or your parents if you are a minor) to verify that you did nothing inconsistent

with your claim of a continuing California residence during your absence. Steps that you (or your parents) should take to retain a California residence include:

1. Continue to use a California permanent address on all records—educational, employment, military, etc.
2. Satisfy California resident income tax obligations. (Note: If you are claiming California residence, you are liable for payment of income taxes on your total income from the date you establish California residence. This includes income earned in another state or country.)
3. Retain your California voter's registration and vote by absentee ballot.
4. Maintain a California driver's license and vehicle registration. If it is necessary to change your driver's license and/or vehicle registration while you are temporarily residing in another state, you must change them back to California within the time prescribed by law.

Classification to Resident Status

All changes of status must be initiated prior to the first day of class for the term which you intend to be reclassified.

Incorrect Classification

If you were incorrectly classified as a resident, you are subject to reclassification and to payment of all nonresident tuition fees not paid. If you concealed information or furnished false information and were classified incorrectly as a result, you are also subject to University discipline. Resident students who become nonresidents must immediately notify the campus residence deputy.

Inquiries and Appeals

Inquiries regarding residence requirements, determination and/or recognized exceptions should be directed to the Residence Deputy or Assistant Residence Deputy, Office of the Registrar, 12 Mrak Hall, Davis, California 95616, (916) 752-0879. **NO OTHER UNIVERSITY PERSONNEL ARE AUTHORIZED TO SUPPLY INFORMATION RELATIVE TO RESIDENCE REQUIREMENTS FOR TUITION PURPOSES.** You are cautioned that this summary is **not** a complete explanation of the law regarding residence. *Please note that changes may be made in the residence requirement between the publication of this statement and the relevant residence determination date.* Any student, following a final decision on residence classification by the residence deputy, may appeal in writing to the legal analyst (Legal Analyst—Residence Matters, 300 Lakeside Dr., 7th Floor, Oakland, CA 94612-3565) within 45 days of notification of the residence deputy's final decision.

UNIVERSITY POLICY ON NONDISCRIMINATION, SEXUAL HARASSMENT, STUDENT RECORDS, AND PRIVACY

Nondiscrimination. The University of California, in accordance with applicable Federal and State law and University policy, does not discriminate on the basis of race, color, national origin, religion, sex, disability, age, medical condition (cancer-related), ancestry, marital status, citizenship, sexual orientation, or status as a Vietnam-era veteran or special disabled veteran. The University also prohibits sexual harassment. This nondiscrimination policy covers admission, access, and treatment in University programs and activities.

Inquiries regarding the University's student-related nondiscrimination policies may be directed to Student Judicial Affairs Director Jeanne Wilson, 463 Memorial Union, 916-752-1128.

Sexual Harassment. Sexual harassment of students, staff, or faculty members is prohibited by law and by University regulation (Policy 380-12). Sexual harassment is unacceptable and will not be condoned on the UCD campus. The campus community will take all necessary and appropriate steps to protect students, staff, and faculty from sexual harassment and all

forms of sexual intimidation and exploitation. The Sexual Harassment Education Program (752-2255) provides information and assists students in resolving complaints of sexual harassment informally. Formal grievance procedures for student complaints charging legally impermissible discrimination (Policy 280-05) are available in the Office of Student Judicial Affairs and may be used to bring complaints of sexual harassment or other discrimination. Students may receive informal counseling and formal assistance by contacting any of the following offices: Vice Chancellors, Deans of the Schools and Colleges, the Office of Student Judicial Affairs, or the Sexual Harassment Education Program. In addition, the ASUCD Student Grievance Center, Counseling Center, and the Women's Resources and Research Center are available to provide referral service.

Disclosures from Student Records. In accordance with the Federal Family Educational Rights and Privacy Act of 1974 and campus procedures implementing the University of California Policies Applying to the Disclosure of Information from Student Records, students at the Davis campus of the University have the right:

- To inspect and review their own records;
- To grieve alleged violations of privacy rights;
- To consent to disclosures from their records, except as disclosures are authorized without consent under law and University policy;
- To request correction of their records; and
- To file complaints with the Department of Education for alleged violations of the rights accorded them by the Federal Act.

These rights are implemented on the Davis campus by UCD Policy and Procedure Manual, Section 320-21, "Disclosure of Information from Student Records."

Questions about these rights should be referred to Jeanne Wilson, Office of Student Judicial Affairs, telephone 916-752-1128. Copies of the Federal Act, the full text of the UC Policies and the UCD Policy and Procedure Manual, Section 320-21, may be consulted at the Reference Desk of the Shields Library. Copies of the UC policies may be obtained at the Office of Student Judicial Affairs.

Categories of personally identifiable information designated by the campus as public information are: name, address (local and/or permanent), telephone numbers, date and place of birth, major field of study, dates of attendance, number of course units in which enrolled; degrees and honors received, the most recent previous educational institution attended, participation in officially recognized activities, including intercollegiate athletics and the name, weight, and height of the participants on intercollegiate University athletic teams, provided, however, that address and telephone numbers are not public information with respect to interns, residents and fellows and that with respect to these students, public information also includes primary hospital assignment, field of residency training, and name of medical school awarding the M.D. degree.

Parental/guardian information is confidential. It is used by the University only for notification of events, ceremonies, awards, and development or in case of an emergency involving the student.

Students may request in writing by the last day of registration that their addresses and telephone listings or all personally identifiable information from their records not be regarded as public information. Students who desire to withhold their addresses and telephone listings may so indicate on the Student Address Form included with registration materials. **If a student does not indicate that he or she wishes to keep his or her address and telephone number confidential, then the information may be released as a matter of public record and will be included in a campus Student Directory.**

Students who desire to withhold all information from the category of public information must file a form in the Office of the Registrar. Students availing themselves of this right should understand what the consequences of such action may be. For example, if all information is designated non-public information, the campus cannot make public any honors received by the student (e.g., the award of a Regents' Scholarship or election to Phi Beta Kappa) and cannot include the student's name and degree earned in the campus commencement program without the student's written consent.

Similarly, the student's status as a student cannot be verified for potential employers without the student's written consent. Finally any degrees earned and the dates they were conferred may not be confirmed for any third party in connection with the appointment of that graduate to a new position or published in connection with an honor that individual subsequently receives. Students may reverse the decision to withhold their address and phone number at registration for a new quarter on the Student Address Form. The decision to withhold address and phone number or all information can be reversed at any time by filing a form with the Office of the Registrar.

Privacy Act. A student's Social Security number is used to verify personal identity in the UCD Student Records System. In accordance with the Federal Privacy Act of 1974, students are hereby notified that disclosure of their social security number is mandatory. This recordkeeping system was established prior to January 1, 1975 pursuant to the authority of The Regents of the University of California under Art. IX, Sec. 9, of the California Constitution.

ACCREDITATION

The University of California, Davis is accredited by the Accrediting Commission for Senior Colleges and Universities of the Western Association of Schools and Colleges, an institutional accrediting body recognized by the Council on Postsecondary Accreditation and the U.S. Department of Education. UC Davis is also accredited by the Association of American Law Schools, American Bar Association, American Dietetic Association, Association of American Medical Colleges, Accreditation Council for Graduate Medical Education, Council on Education of the American Veterinary Medical Association, Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology, American Chemical Society, American Assembly of Collegiate Schools of Business, American Society of Landscape Architects, the Commission on Teacher Credentialing, and the Joint Commission on Accreditation of Hospitals. Students interested in reviewing the accreditation documents may do so by scheduling an appointment with the Office of the Provost, Mrak Hall.

THE BOARD OF REGENTS

Governance of the University is entrusted to a corporation called The Board of Regents. Of the individuals composing the board, 19 are prominent California citizens appointed by the Governor; and seven, including the President of the University and the Governor of California, serve ex officio. A Student Regent is selected each year from a list of names submitted to the board by the Student Body Presidents' Council.

The Regents have delegated authority in academic matters to the Academic Senate of the faculty, which determines academic policy and supervises the instructional activities of the entire University. All of the permanent faculty, as well as key administrators, are members of the Senate.

The Regents have delegated authority for the organization of the University to the president. Jack W. Peltason is president and head of the Universitywide administration. Authority for the administration of each campus has been delegated to a chancellor.

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

Regents Ex Officio

Pete Wilson
Governor of California and President of The Regents

Leo T. McCarthy
Lieutenant Governor of California

Willie L. Brown, Jr.
Speaker of the Assembly

State Superintendent of Public Instruction

Robert E. Murphy
President of the Alumni Associations of the University of California

Roy L. Shults
Vice President of the Alumni Associations of the University of California

Jack W. Peltason
President of the University

David Flinn

Peter Preuss

Appointed Regents

(Current term expires on March 1 of year indicated)

William T. Bagley	(2002)
Roy T. Brophy	(1998)
Clair W. Burgener	(2000)
Glenn Campbell	(1996)
Frank W. Clark, Jr.	(2000)
Ward Connerly	(2005)
John G. Davies	(2004)
Tirso del Junco, M.D.	(1997)
Alice J. Gonzales	(1998)
S. Sue Johnson	(2002)
Meredith J. Khachigian	(2001)
Leo S. Kolligian	(1997)
Howard H. Leach	(2001)
S. Stephen Nakashima	(2004)
Dean A. Watkins	(1996)

Student Regent

Terrence Wooten (UCR) (June 30, 1995)

Faculty Representatives

Arnold Binder
Daniel Simmons

Principal Officers of The Regents

James E. Holst
General Counsel and Vice President—Legal Affairs

Herbert M. Gordon
Treasurer

Patricia L. Trivette
Secretary

ADMINISTRATIVE OFFICERS OF THE UNIVERSITY

Jack W. Peltason
President of the University

Walter E. Massey
Provost and Senior Vice President—Academic Affairs

V. Wayne Kennedy
Senior Vice President—Business and Finance

William B. Baker
Vice President—University and External Relations

Cornelius L. Hopper, M.D.
Vice President—Health Affairs

Kenneth R. Farrell
Vice President—Agriculture and Natural Resources

James E. Holst
General Counsel and Vice President—Legal Affairs

UNIVERSITY CHANCELLORS

Chang-Lin Tien
Chancellor at Berkeley

Larry N. Vanderhoef
Chancellor at Davis

Laurel L. Wilkening
Chancellor at Irvine

Charles E. Young
Chancellor at Los Angeles

Raymond L. Orbach
Chancellor at Riverside

Richard C. Atkinson
Chancellor at San Diego

Joseph B. Martin
Chancellor at San Francisco

Henry T. Yang
Chancellor at Santa Barbara

Karl S. Pister
Chancellor at Santa Cruz

ADMINISTRATIVE OFFICERS—DAVIS

Chancellor

Larry N. Vanderhoef, Ph.D.

Chancellor Emeritus

James H. Meyer, Ph.D.

Vice Chancellors

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University Extension

Charles A. Lacy, Ph.D., *Interim Dean*

PROPORTION OF UC DAVIS GRADUATES FINDING WORK IN THEIR FIELDS OF CHOICE¹

The percent of alumni whose full-time job is in the field of their choice is shown by field of study. Figures do not include the 13 percent of graduates who had not decided on a career field at the time of the survey.

Field of Study ²														Total Percent
Animal Science	Applied Economics	Behavioral Science	Computer Science	Food Science	Plant Science	Bio- science	Resource Science	Engi- neering	Fine Arts	Letters	Mathematics/ Statistics	Physical Science	Social Science	
79	76	82	94	81	100	66	77	91	56	71	80	90	69	75

(Percentage finding work in field of choice)

¹Source: A 1991 survey of 1989-90 graduates conducted by Student Affairs Research and Information, UC Davis.

²Fields of Study are groups of related undergraduate majors; for example, 'Animal Science' would include such majors at UC Davis as Animal Science, Avian Sciences, and Wildlife and Fisheries Biology.

RETENTION DATA¹ AND GRADUATION RATES AT UC DAVIS**Freshmen**

(Retention and graduation rates through Spring 1993 for all undergraduates entering UC Davis from high school.)

Fall Quarter of Initial Enrollment:	Number of Students	Percent Enrolled 4 Quarters	*Percent Graduating in	
			12 Quarters	15 Quarters
1983	2,434	92%	31%	70%
1984	3,010	93%	28%	71%
1985	2,718	91%	29%	68%
1986	2,475	93%	28%	71%
1987	3,336	93%	29%	70%
1988	3,417	93%	30%	63%

Transfer Students

(Retention and graduation rates through Spring 1993 for all undergraduates transferring to UC Davis as juniors.)

Fall Quarter of Initial Enrollment:	Number of Students	Percent Enrolled 4 Quarters	*Percent Graduating in	
			6 Quarters	9 Quarters
1984	535	89%	39%	75%
1985	464	92%	40%	75%
1986	455	91%	36%	79%
1987	520	92%	31%	77%
1988	569	91%	31%	75%
1989	623	92%	31%	71%
1990	844	92%	34%	66%

*These are not necessarily quarters of continuous enrollment. Students may drop out or go on Planned Educational Leave for a quarter or longer, and then resume their studies. (There are three quarters in each academic year.)

¹Source: Student Affairs Research and Information, UC Davis (January 1994).

AVERAGE MONTHLY SALARY OFFERED TO GRADUATES WITH BACHELOR'S, MASTER'S, AND DOCTORATE DEGREES¹

Field of Study:	Average Monthly Salary		
	Bachelor's	Master's	Doctorate
Engineering	\$2749	\$3288	\$4436
Humanities/Social Sciences	\$1893	\$2448	\$2678
Health Sciences/Life Sciences	\$2196	\$2578	\$2948
Physical Sciences	\$2230	\$2837	\$3829

¹Source: 1993 National Salary Survey data provided by the College Placement Council.

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BICYCLES



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Location
Location