



UC/DAVIS

General
Catalog
1980-81

CORRESPONDENCE DIRECTORY

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

Office of the Chancellor

Mrak Hall
752-2063

College of Agricultural and Environmental Sciences

228 Mrak Hall
752-0107

College of Engineering

2132 Bainer Hall
752-0553

College of Letters and Science

150 Mrak Hall
752-0392

Graduate School of Administration

111 Voorhies Hall
752-7362

School of Law

1011 King Hall
752-0243

School of Medicine

Medical Sciences 1C
752-0331

School of Veterinary Medicine

1024 Haring Hall
752-1360

Graduate Division

252 Mrak Hall
752-0650

Division of Extended Learning

376 Mrak Hall
752-2820

Admissions

- Undergraduate:** Office of Admissions
175 Mrak Hall
752-2971
EOP Office of Admissions
175 Mrak Hall
752-2992
- Graduate:** Graduate Division Admissions
252 Mrak Hall
752-0655
- Administration:** Graduate School of Administration
111 Voorhies Hall
752-7362
- Law:** School of Law Admissions
1011 King Hall
752-0243
- Medicine:** School of Medicine Admissions
Medical Sciences 1C
752-0331
- Veterinary
Medicine:** School of Veterinary Medicine Admissions
1024 Haring Hall
752-1360

Registrar's Office

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

Financial Aid Office

North Hall
752-2390
(undergraduate and graduate loans, grants, work-study)

Scholarship Office

University House Annex
752-2397
(undergraduate scholarships)

Fellowships and Graduate Scholarships

Graduate Division
252 Mrak Hall
752-0650

Teaching and Research Assistantships

Write to department or group concerned. Addresses given in the *Announcement of the Graduate Division*.

Housing

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

ASUCD (Associated Students UCD)

3rd floor, Memorial Union
752-1990

Memorial Union Information Desk

752-2222

Office of Public Affairs

334 Mrak Hall
752-1930

Relations with Schools

175 Mrak Hall
752-1099

Residency Matters, Attorney in

590 University Hall
University of California
Berkeley, CA 94720

Student Health Service

54A Cowell Hospital and Student Health Center
752-2300

Visitors Services and Ceremonies

129 Mrak Hall
752-0539
(campus tours, maps, and information)

The cover illustration shows the Main Theatre in the UCD Fine Arts Complex.

The quotes interspersed throughout the text have been collected over the years from students, faculty, staff, and alumni at UCD.

Howard L. Needles
DIVISION OF TEXTILES And CLOTHING

UC/Davis

General Catalog
1980-81

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the Registrar. (Make checks payable to: The
Regents of the University of California.)**

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

COMPLIANCE STATEMENT

The University of California, in compliance with Titles VI and VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972 (45 CFR 86), and Sections 503 and 504 of the Rehabilitation Act of 1973, does not discriminate on the basis of race, color, national origin, religion, sex, or handicap in any of its policies, procedures, or practices; nor does the University, in compliance with the Age Discrimination in Employment Act of 1967 and Section 402 of the Vietnam Era Veterans Readjustment Act of 1974, discriminate against any employees or applicants for employment on the basis of their age or because they are disabled veterans or veterans of the Vietnam era. This nondiscrimination policy covers admission, access, and treatment in University programs and activities, and application for and treatment in University employment.

In conformance with University policy and pursuant to Executive Orders 11246 and 11375, Section 503 of the Rehabilitation Act of 1973, and Section 402 of the Vietnam Era Veterans Readjustment Act of 1974, the University of California is an affirmative action/equal opportunity employer.

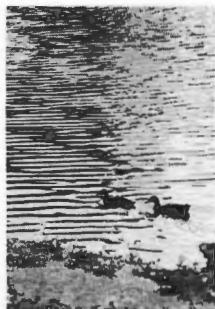
Inquiries regarding the University's equal opportunity policies may be directed to the Vice Chancellor of Academic Affairs and Affirmative Action Officer, 515 Mrak Hall, 752-2070. Speech and hearing impaired persons may dial 752-6TTY.

UC/Davis

General Catalog 1980-81



HOW TO USE THIS CATALOG



We intend the UC Davis General Catalog as a source of information about the Davis campus course offerings, academic programs, campus facilities, services, fees, requirements, and campus life. We know that it is used for a variety of ends and purposes by both current and prospective students and their advisers. While we attempt to provide information for all of these uses, you may find that some information you need is not given. Therefore, throughout the book, we refer to other publications available from individual offices or departments. In the Correspondence Directory on the inside front cover you will find a list of the most frequently questioned offices and their addresses. (Please refer to the Index for locations of other offices or department addresses.) On page 317 there is a list of major publications and where you can request them.

The Catalog is divided into four major sections:

- Information about the University and the campus, student services, fees, admissions, and scholastic requirements
- Information about individual schools and colleges
- Descriptions of specific courses of study, undergraduate major requirements and courses offered, and lists of the faculty in departments and programs
- Appendix and Index

Prospective students may wonder "What is the Davis campus like?" The first section is intended to give you a general impression of the campus. You should supplement this impression by reading, in the second section, the description of the college or school which interests you. Section three is intended to answer the question, "What does UCD offer to help me reach my goals?" If you are a prospective freshman or international student, you may find it helpful to look over the Glossary of unfamiliar terms on page 318. The names of some majors may not convey to you what academic areas courses cover, so please check the lists of courses offered to satisfy the requirements of any unfamiliar major. Department chairpersons, program directors, major advisers, or any faculty member listed with these major offerings would be happy to answer any further questions you might have. Prospective graduate students might also wish to send for the *Announcement of the Graduate Division* (Graduate Division Office, 252 Mrak Hall) which provides descriptions of graduate programs and requirements, although not descriptions of courses.

Current students should refer to the Catalog throughout their years here to answer specific questions on regulations, requirements, and course offerings. Although every effort is made to keep the Catalog correct and current, inevitably there will be some changes in courses offered or instructors assigned. You should,

therefore, check the quarterly *Class Schedule and Room Directory* for the up-to-date list of courses offered.

Advisers of prospective students may wish to send for the *Planning Guide to Majors*, distributed by the Office of Relations with Schools (175 Mrak Hall), for more comprehensive information on programs and their requirements.

We are always trying to make the Catalog more helpful, so please let us know of difficulties you encounter in using it or send us your suggestions for improvement (Publications Office, Reprographics Building or Registrar's Office, 124D Mrak Hall).

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CALENDAR

Academic Calendar*

	FALL 1980	WINTER 1981	SPRING 1981	FALL 1981
● Pick up registration and course enrollment materials from the Registrar's Office (all continuing students).	June 4-Aug. 29	Nov. 12-14 (1980)	Feb. 18-20	
● Advisers available to all students (except Engineering).	June 5-6	Nov. 13-14	Feb. 19-20	
● Advisers available to all Engineering students.	June 5-6	Nov. 17-18	Feb. 23-24	
● Turn in Registration Packets, course enrollment materials, and Fee Payments (all continuing students).	June 16-Aug. 29	Nov. 17-18	Feb. 23-24	
● Late Registration for continuing students.	Aug. 30-Oct. 15	Nov. 19-Jan. 20	Feb. 25-Apr. 17	
● Quarter begins.	Mon., Sept. 29	Mon., Jan. 5	Thurs., Apr. 2	
● Orientation and testing.	Sept. 29-Oct. 1	Jan. 5-6	Apr. 2-3	
● Class Schedule Pickup and Open Registration.	Sept. 29-30			
● In-Person Registration.		Jan. 5	Apr. 2	
● Instruction begins.	Thurs., Oct. 2	Wed., Jan. 7	Mon., Apr. 6	
● Final day of late registration.	Wed., Oct. 15	Tues., Jan. 20	Fri., Apr. 17	
● Final date to file petitions to change status from part-time to full-time student, or vice versa.	Oct. 15	Jan. 20	Apr. 17	
● Final date to file petitions for PELP.	Oct. 15	Jan. 20	Apr. 17	
● Final date to petition to add courses to study list.	Oct. 15	Jan. 20	Apr. 17	
● Final date to petition to drop courses (thereafter permission may be granted only by the dean of your school or college and only under exceptional circumstances).	Wed., Nov. 5	Tues., Feb. 10	Fri., May 8	
● Final date for undergraduates to file petitions with the dean of their college or school to take courses on a P/NP basis. Exceptions rarely approved.	Nov. 5	Feb. 10	May 8	
● Final date for graduate students to file petitions with the Dean of the Graduate Division to take courses on a S/U basis.	Nov. 5	Feb. 10	May 8	
● Final date to file Independent Study Program project proposal form (available at the dean's office) either with the student's college dean or directly with Committee on Courses of Instruction.	Aug. 15	Nov. 3	Feb. 10	Aug. 14
● Instruction ends.	Fri., Dec. 12	Tues., Mar. 17	Thurs., June 11	
● Final examinations.	Dec. 15-20	Mar. 19-25	June 13-19	
● Quarter ends.	Dec. 20	Mar. 25	June 19	
● Commencement.			Mid-June	
● Academic and Administrative Holidays.	Thurs.-Fri., Nov. 27-28 Thurs.-Fri., Dec. 25-26 Thurs.-Fri., Jan. 1-2	Mon., Feb. 16 Mon., Mar. 30	Mon., May 25	Fri., July 3 (Summer) Mon., Sept 7

Candidates for Degrees Undergraduates

● Final date for those who expect to complete work for A.B. and B.S. degrees to file an Announcement of Candidacy with the Registrar.	Wed., Oct. 15	Tues., Jan. 20	Fri., Apr. 17	Fri., July 3 (for Sept. '81)
● Final date for Letters and Science students who plan to complete work for a minor program to file applications with the Dean's Office.	Fri., Oct. 17	Fri., Nov. 21 (1980)	Fri., Feb. 27	Fri., Feb. 27 (for Sept. '81)

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

Graduate Students

	FALL 1980	WINTER 1981	SPRING 1981	FALL 1981
● Final date for those who expect to complete work for master's degrees to file applications for candidacy with the Dean of the Graduate Division.	Mon., Oct. 6	Mon., Dec. 8 (1980)	Fri., Mar. 6	Mon., June 1 (for Sept. '81)
● Final date for candidates for master's degrees to file theses with the committee in charge.	Mon., Nov. 3	Mon., Feb. 16	Fri., May 15	Aug. 3 (for Sept. '81)
● Final date for candidates for master's degrees to file theses with the Dean of the Graduate Division.	Fri., Dec. 19	Wed., Mar. 25	Fri., June 19	Sept. 11 (for Sept. '81)
● Final date for those 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 the Graduate Division.	Fri., Aug. 15	Mon., Nov. 17 (1980)	Mon., Mar. 2	May 22 (for Sept. '81)
● Final date for candidates for the degrees of Doctor of Philosophy and Doctor of Engineering to file theses with the committee in charge.	Wed., Oct. 1	Mon., Jan. 5	Wed., Apr. 1	July 1 (for Sept. '81)
● Final date for candidates for the degrees of Doctor of Philosophy and Doctor of Engineering to file theses with the Dean of the Graduate Division.	Mon., Dec. 1	Mon., Mar. 2	Mon., June 1	Aug. 31 (for Sept. '81)

Admission Deadlines

● Applications for admission to undergraduate standing, including applications for intercampus transfer and EOP must be filed with complete credentials with the Office of Undergraduate Admissions on or before this date.	Fri., Nov. 30 (1979)	Thurs., July 31 (1980)	Fri., Oct. 31 (1980)	Nov. 30 (1980)
● Applications for admission to graduate standing, with complete credentials, must be filed with the Dean of the Graduate Division on or before this date.	June 1	Oct. 1 (1980)	Jan. 1	June 1
● Applications for admission to the School of Law for 1981-82 must be filed with the School on or before this date.				Mar. 1
● Applications for admission to the Graduate School of Administration for 1981-82 must be filed with the School on or before this date.				Mar. 1
● Applications for admission to the School of Medicine for 1981-82 must be filed with the School on or before this date.				Nov. 1 (1980)
● Applications for admission to the School of Veterinary Medicine for 1981-82 must be filed with the School on or before this date.				Nov. 1 (1980)
● Applications for readmission to undergraduate status must be filed with the Registrar on or before this date.	Mon., Sept. 8	Mon., Dec. 15 (1980)	Mon., Mar. 16	Mon., Aug. 31
● Applications for readmission to graduate status must be filed with the Registrar on or before this date.	Mon., Aug. 4	Mon., Nov. 17 (1980)	Mon., Feb. 9	Mon., Aug. 3 (1980)

Financial Aid Deadlines

● Applications for grants, loans, work-study, and California Student Aid Commission awards must be filed with the Financial Aid Office on or before this date.		Thurs., Feb. 12		
● Applications for UCD undergraduate scholarships for 1981-82 must be filed with the Scholarship Office on or before this date.		Thurs., Jan. 15		
● Applications for President's Undergraduate Fellowships for 1981-82 must be filed with the Scholarship Office on or before this date.	Fri., Nov. 14			
● Applications for fellowships and graduate scholarships for 1981-82 must be filed with the Graduate Division on or before this date.		Thurs., Jan. 15		



Introduction

THE UNIVERSITY OF CALIFORNIA

When the first transcontinental railroad cars steamed into the western terminal in Sacramento, only 40 students — taught by 10 professors — were enrolled in the University of California. A year earlier, in 1868, Governor Henry H. Haight signed the Organic Act which provided that a "complete University" be created for the State of California. Classes began in 1869 on the campus of the College of California in Oakland. The first few buildings on the Berkeley campus were completed in 1873, and that year the University took up residence in its new home. The following June, degrees were conferred upon the University's first 12 graduates.

Today the University has nine campuses throughout the State of California — Berkeley, Davis, Irvine, Los Angeles, Riverside, San Diego, San Francisco, Santa Barbara, and Santa Cruz. Each campus has its own distinct atmosphere, features, and character; all are recognized nationally and internationally as distinguished educational institutions. The University also maintains research and field stations, Extension centers, and instructional facilities in more than 80 locations throughout California.

The nine campuses of the University have a current enrollment of more than 127,000 students, 90 percent of them residents of California. Nearly one-third of the students are studying at the graduate level.

The University's reputation for excellence has attracted a distinguished faculty of scholars and scientists in all fields of scholarship. In a recently conducted survey, published in the *Chronicle of Higher Education*, 4,000 faculty at four-year colleges and universities throughout the U.S. were asked to name the departments in their disciplines which "have the most distinguished faculties." Four UC campuses, including UC Davis, were named to the top ten in at least one field and two campuses were named in more than five fields. The University has 16 Nobel Laureate winners on its faculty, and the total membership from all nine campuses in the National Academy of Sciences is the largest of any

college or university system in the country. In 1979, 26 scholars from seven campuses of the University received fellowship grants from the John Simon Guggenheim Foundation. These fellowships are among the highest honors that scholars can receive.

Governance of the University is entrusted to a corporation called The Board of Regents. Of the individuals comprising the Board, 18 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.

Last year's Student Regent, Hector Cruz Lozano, was from UC Davis. This was the second time since 1975, when the first Student Regent was selected, a UC Davis student has been chosen for this important post.

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. David S. Saxon is President and head of the Systemwide Administration. Authority for the administration of each campus has been delegated to a Chancellor.

THE DAVIS CAMPUS

James H. Meyer, Chancellor of UC Davis, administers this campus of 17,400 students, 1,400 teaching faculty and 6,000 staff.

The Davis campus has undergraduate colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science. The Graduate Division administers graduate study and research at all schools and colleges. Professional studies are carried on at the schools of Law, Medicine, and Veterinary Medicine,

and a graduate School of Administration will open its doors to students in the fall of 1981. Approximately 5,000 students are engaged in graduate or professional study. The Division of Extended Learning extends University knowledge, expertise, and cultural activities to individuals in surrounding communities.

The University of California, Davis is accredited by the Western Association of Schools and Colleges, Association of American Law Schools, Association of American Medical Colleges, Council on Education of the American Veterinary Medical Association, Engineers' Council for Professional Development of the American Society of Engineering Education, American Chemical Society, and the Commission for Teaching Preparation and Licensing.

UCD's History

In 1906 the University of California acquired 768 acres surrounding the town of Davisville for a University farm. The Farm (as UCD was originally known) was established to serve the rural population of California, offering three years of instruction in the principles and practices of managing soils, crops, and animals. The need for such training was recognized and plans for the farm encouraged by Sacramento Superior Court Judge Peter J. Shields, the "Father of the Davis Campus."

The demand for greater educational opportunities in the state increased rapidly and in 1922, in conjunction with the UC Berkeley College of Agriculture, the degree of Bachelor of Science in Agriculture was granted those who completed the Davis program. A few years later, the Davis campus had its own College of Agriculture and, in 1946, the School of Veterinary Medicine (still the only one in the state) was established.

The campus's most rapid expansion began in 1951 when the College of Letters and Science was founded and more varied degree programs became available. In 1959, The Regents declared Davis a general campus of the University. By 1961, graduate programs were so numerous that a Graduate Division was established as a separate administrative unit. The College of Engineering came into existence the following year, owing much to the foundation already provided by the curriculum in Agricultural Engineering. 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. The graduate School of Administration will begin holding classes in the fall of 1981.

UCD has long been known for teaching and research in agricultural sciences. This year its faculty in agriculture was named as one of the top five in the country by peers throughout the nation. The reputation of the Davis campus in many other fields has advanced as Davis has moved into the ranks of the top 25 general research universities in the United States.

The quality of undergraduate instruction is a prime concern of the faculty, students, and administration at Davis. Creative teaching and academic innovation are



encouraged by several programs, including the Distinguished Teaching Awards (for which students can nominate outstanding faculty members), instructional improvement funds (for improving the quality of undergraduate teaching), the Teaching Resources Center programs which aid faculty members and teaching assistants in sharpening their teaching skills, and the Learning Resources Center programs which assist in the preparation of materials for use in classrooms and in self-paced learning activities. *Student Viewpoint*, a student-written and published evaluation of classes and instructors, is compiled each year from course questionnaires completed by students.

Campus Life

The Davis campus has always been especially noted for its friendliness and informality. To many people, Davis brings to mind Picnic Day (the annual campus open-house in April) and the almost universal use of bicycles within the community. Since the Davis campus is a residential community and was originally small and isolated, a tradition of close relations between students and faculty has developed. Even though the campus has now grown to 17,400 students, its style remains friendly, informal, and personal.

UC Campuses:
Berkeley
Davis
Irvine
Los Angeles
Riverside
San Diego
San Francisco
Santa Barbara
Santa Cruz

Beneath the casual and informal outlook of Davis students, however, there is an underlying seriousness and an emphasis on academic excellence. Davis students do study hard. However, those who think of Davis as just a place to study, will be surprised by the variety of activities happening every day on campus. There is rarely a night without at least one movie, a day without a long list of public lectures, or a weekend without a play, concert, or special event.

The Davis Campus Today

Looking around the campus you can see modern concrete and glass buildings contrasting with the older, original wooden structures from the University Farm days. But the newest building on the main campus — set between Sproul Hall, a nine-story concrete office tower, and University House, one of the oldest buildings on campus — is a harmonious blend of redwood, glass, and concrete.

The planned expansion of the Davis campus is nearing completion, and, although some of the buildings are less than a decade old, the spirit of its past as the University Farm gives UCD a sense of tradition. A University is never static, always changing to meet new needs and new conditions. Looking back, we can see that the campus has developed in ways which the founders of the University Farm could never have envisioned. But looking ahead, out of an era in which the role of the University in society is being reexamined, we can predict that the Davis campus will retain its fundamental assumption that academic programs at all levels of the University — undergraduate, graduate, professional, and research — must reinforce and strengthen each other.

The root word of University, the Latin *universitas* — entirety — reflects UCD's aim to bring together learning and life, scholarship and teaching, theory and practice, and general and professional education.

The Setting

The Davis campus lies adjacent to the city of Davis (population 36,400), 15 miles west of Sacramento and 72 miles northeast of San Francisco. Sacramento, with all its resources as the state capital, is only twenty minutes away, yet Davis is surrounded on all sides by open space — including some of the most valuable agricultural land in the state. The total campus comprises approximately 3,800 acres. About 980 acres are devoted to the central campus, the remainder being used for agricultural research and for such special facilities as the Veterinary Medical Teaching Hospital, the California Primate Research Center, and the University Airport. (The University of California Davis Medical Center is located in Sacramento.)

Its location makes Davis ideal for access to outdoor recreation. Within a 70-mile radius are Lake Berryessa, Folsom Lake, Clear Lake, the famed Napa Valley, and the historic Mother Lode country. San Francisco is a little more than an hour's drive from Davis along Interstate Highway 80. The coastal areas of Mendocino and

Santa Cruz are about 150 miles from Davis, as are Lake Tahoe and the ski areas of the Sierra Nevada.

Winters in Davis are mild, with the temperatures rarely below freezing. It hardly ever snows in the winter, but you should get good use from your raingear. Average winter temperatures range from 36° to 54°. Summers are sunny, hot, and dry. Although some days the thermometer may exceed 100°, the overnight temperatures can drop into the 50°s. Davis weather in the spring and fall is among the most pleasant in the state.

Davis is very much a bicycling town. More than 30 miles of bike paths and 30,000 bicycles have given Davis the title, "City of Bicycles." One study found that bicycles are used for 25 percent of all travel in Davis.

The central UCD campus is closed to motor vehicles and automobile parking lots are located on its perimeter. Special parking places are reserved for handicapped drivers (those with special disability license plates) and ramps at most buildings provide easy access for wheelchairs. Sidewalks have inclines to street level at intersections.

The Regional Transit System linking Davis with the nearby cities of Woodland and Sacramento is supplemented by Unitrans, seven bus lines operated by the Associated Students. A Greyhound bus terminal and Amtrak station are also located in town, and the Sacramento Metropolitan Airport is a 20-minute drive from Davis.

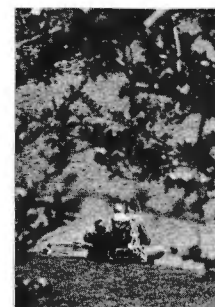
The City of Davis

The year 1868 marked not only the Act of the Legislature chartering the University of California but also the completion of the California Pacific Rail Road line from Vallejo to a junction located on the former Jerome C. Davis farm and the founding of the city of "Davisville."

The community is closely tied to the University (more than half of the people in Davis are University students, faculty members, or staff) yet the city has developed its own recreational, cultural, and community outlets to supplement the University's offerings. The Davis Art Center, adult education programs, community theater, local galleries, recreation and parks programs, and civic organizations have strong local support. The Veterans Memorial Center complex is a focus of community events and has facilities for concerts and theatre performances, exhibits, meetings, and special events.

Since its early years, Davis has recognized the importance of open space. It now operates thirteen large and grassy city parks, many with tennis courts, playgrounds, swimming pools, and playing fields as well as a municipal golf course.

The city of Davis is changing. It still retains many characteristics of the small college town it once was, but the growth of the University has brought a corresponding development within the community. From fewer than 22,000 people only a decade ago, the population of Davis stands today at 36,400.



I'd like to see Davis remain a progressive, environmentally concerned place. It's a good way to live.
— Senior, Environmental Toxicology

Despite the pressures of rapid growth, people in Davis are actively concerned with maintaining the quality of life here. The small-town flavor is being preserved in the downtown core area — the city's central business district — and action by the citizens and City Council have emphasized that concern with the quality of life means a commitment to planned, environmentally sound development and limited growth.

Davis is possibly the most energy-conscious city in the U.S. Since 1973, average residential electrical consumption has dropped by 18 percent, compared with an 8 percent rise nationally during that same period. A series of energy-savings ordinances passed since 1968 regulates such things as new home insulation and window area and requires all new housing developments to have bicycle paths. The annual "Sun Day" both celebrates and encourages exploration of alternative energy sources.

THE UNIVERSITY LIBRARY

Information:
Peter J. Shields Library Office
108 Shields Library
752-2110

The library on the Davis campus contains more than 1,607,000 volumes and receives more than 41,400 periodicals, serials, and government publications annually. Its holdings in the natural sciences and agriculture are outstanding. There are strong collections in the humanities, social sciences, fine arts, and engineering. Materials in law and medicine are already substantial and are still growing. According to a recent survey by the Association of Research Libraries, the UCD Library ranks twenty-sixth among the ninety-four academic libraries surveyed on its "overall library index."

In addition to the main stack collection in the Peter J. Shields Library, there are 1,402,500 items on microcopy, 62,700 maps, 472,500 pamphlets, 18,700 rare books, 13,350 sound recordings, and a center containing a bibliographic collection of worldwide scope. The use of most Library materials has been made easier by a computerized control system.

The Library provides orientation and assistance in using the various library collections, which operate on an open-stack basis to permit users direct access to the shelved volumes. Audiotape walking tours and lectures on the uses and resources of the library are part of the Educational Services Program. A 3-credit course, "Introduction to Library Research and Bibliography" (English 28), is given most quarters. A non-credit class called "Library Survival" is also offered.

Researchers, faculty members, and students have a valuable research tool in the Automated Information Retrieval Services (AIRS) located in the Humanities-Social Sciences Reference Department and the Biological and Agricultural Sciences Department (of Shields Library), in the Physical Sciences Library, and in the Health Sciences Library. Through computers located

at two off-campus locations, bibliographies and reference lists on a wide range of topics are available from the periodical literature of the last three to eight years. AIRS can provide bibliographies and conduct searches on subjects in agriculture, biology, chemistry, education, engineering, geology, the humanities, the medical sciences, nutrition, physics, and psychology.

The Shields Library is an official depository for Federal and State publications, and the Government Documents Department provides services that make it easier to use these publications.

The Reserve Book Service lends, on a short-term basis, material which is heavily used because of assigned class readings.

Unbound periodical titles — some 6,300 — are housed in the Periodicals Room in a closed-stack area. They are for use in the Shields Library only.

The Department of Special Collections provides assistance in the use of rare books, the Hinman collator, University archives, The Performing Arts Collection, and the 350,000-item F. Hal Higgins Library of Agricultural Technology.

Other facilities at the Shields Library include a browsing collection for recreational reading, headphones for music listening, audio-visual equipment, a typing room, an outdoor reading area, a graphic arts loan collection, and copying machines at various locations.

In addition to the collections and facilities of the Shields Library, there are branch libraries for the health sciences, the physical sciences and engineering, and agricultural economics. The Health Sciences Library's approximately 166,750 volumes support programs in both human and veterinary medicine. The Physical Sciences Library contains 148,250 volumes and also houses a collection of more than 576,500 Research Reports of the U.S. Department of Energy, the National Aeronautics and Space Administration, the Nuclear Regulatory Commission, and other governmental agencies. An independent Law Library housing about 169,600 volumes supports the instructional and research programs of the School of Law. There are also a number of specialized departmental libraries located on the campus.

RESEARCH AND SERVICE ACTIVITIES

The following facilities are connected with the Davis campus. Some are designed for the purpose of research, some for research and teaching, others to provide services to Davis students, faculty, or the surrounding community.

University Arboretum

Arboretum Headquarters
Temporary Building 32
752-2498

The Arboretum occupies an area of about 111 acres, providing materials for teaching and research. Most of

Something everybody should know about is the term paper advisers in the library. With them my first paper was only a SMALL trauma.
— Freshman, Political Science

the plants are attractive but drought-tolerant trees and shrubs. The acreage also includes paths and picnic tables for recreation.

Outstanding plant collections are represented by the oaks in the Shields Grove, the California native trees and shrubs, and the T. Elliott Weier Redwood Grove. Other collections of great horticultural and botanical interest include plantings of acacia, ceanothus, eucalyptus, hakea, and exotic conifers, as well as various groups in the Heath family (*Ericaceae*), Legume family (*Leguminosae*), and Myrtle family (*Myrtaceae*).

The Arboretum program of seed exchange, initiated in 1961, has provided the University with numerous exotic plant specimens and also serves to distribute California native plants throughout the world.

Work-learn internships for Davis students are available in botany, horticulture, and environmental education.

Center on Administration of Criminal Justice

101 King Hall
752-2893

The Center is a joint law-social science program which works to bring about greater understanding and meaningful reform in the criminal justice system. Current research projects include studies in the area of juvenile delinquency, bail reform, and police practices. In addition to conducting research, staff of the Center also assist students, faculty, and citizens who are interested in studying or researching the criminal justice system.

Agricultural History Center

378 Voorhies Hall
752-1827

The Center coordinates and administers several research and publication programs designed to further the study of agricultural history. The primary research activity is a study of the causes and consequences of agricultural mechanization in the nineteenth and twentieth centuries.

The Center was founded in 1964 and assumed the responsibility of editing *Agricultural History*, the journal of the Agricultural History Society. The Center also oversees a continuing program that publishes bibliographies on American agricultural history.

California Primate Research Center

Primate Center
752-0447

The research staff of the California Primate Research Center investigates selected human health problems for which the nonhuman primate is the animal model of choice. Major research programs are in behavioral biology, perinatal biology and reproduction, and respiratory diseases. Primate medicine and primate pathology teams are responsible for the maintenance of the health of the colony and for research on spontaneous diseases. Increased emphasis is being given to breeding primates needed for the research grants.



The Center, established in 1962, is supported by an operating grant from the National Institutes of Health. Much of the research is supported by 27 extramural grants and contracts awarded by a variety of national and international agencies.

The facilities and training programs of the Center are currently being used by 64 core and affiliate faculty members, over 50 collaborating scientists, over 100 undergraduate and graduate students, 5 visiting scientists, and approximately 53 technical and supporting core staff members.

Computer Center

50-I Hutchison Hall
752-0233

The Computer Center, located in the basement of Hutchison Hall, has a dual processor Burroughs 6700 Computing System. This system services the campus for batch, remote job entry, and interactive timesharing computing. In addition, three Digital Equipment Corporation PDP 11/70 Systems are installed to support more than 100 on-line terminals for student computing. The Center's top priority is service to students and, therefore, instructional usage has priority over research and administrative usage.

Davis has developed an innovative Easy Access System of Computing for student use. Every student on the Davis campus, upon presentation of a valid registration card at the Computer Center office, may open an Easy Access Account. A specified sum is allotted to each student from instructional funds, and, within general confines, the student may use the funds to purchase computer time for any project.

The Center operates Remote Computing Stations at various locations on campus. Services at these stations include keypunches, limited programming consulting, reference manuals, and a limited number of interactive terminals.

There is a classroom computing facility in Room 208 Storer Hall where the Center maintains 16 Tektronix Graphic Terminals for classes and student use. The facility is open to students any time it is not scheduled for classroom instruction.

Center for Consumer Research

148 Everson Hall
752-2647

The Center is a small and comparatively new research unit devoted to consumer issues. Major areas of interest include product and service quality, consumer information and education, consumer decision behavior, and institutions and public policy as they relate to consumer issues. Activities of the Center include support of consumer projects undertaken by faculty, graduate students, and Extension specialists; a colloquium series; and a newsletter, in addition to a core research program.

The Consumer Research Center began operation in 1977 and has been supported since that time by the College of Agricultural and Environmental Sciences.

Early Childhood Education Center

Temporary Building 117
752-2888

The Center was established in 1963 by the Department of Applied Behavioral Sciences and serves as a laboratory facility for students majoring in Human Development and for other students interested in young children. There are four programs at the Center: one for infants, ages four to eighteen months, one for toddlers, ages eighteen to thirty months, and two for preschoolers ages 2½ to 5 years. Students from several classes use the facilities, some doing observational studies and others gaining experience working with the children. The students learn to relate theory and practice, developing their abilities as they explore the profession of early childhood education. Enrollment information may be obtained by calling or writing the Center.

Food Protection and Toxicology Center

109 Environmental Toxicology Building
752-1142

The Center sponsors and coordinates research into the nature, transport, and biologic effects of pesticides and other toxic agents. It develops analytical methods for detecting and measuring trace amounts of toxic materials, and studies their accumulation, storage, and breakdown in the environment.

Studies serve medicine, agriculture, the food-processing industry, and the public, through the examination of chemical and microbial hazards in agricultural production and in the processing and preservation of food.

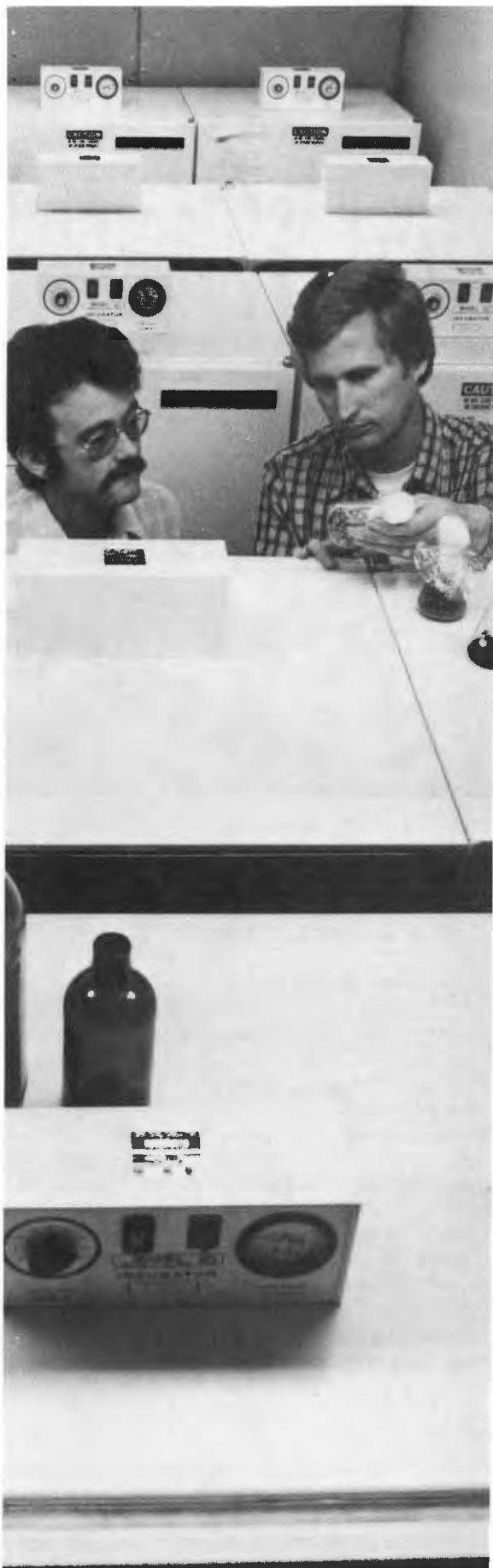
Water Resources Center

2102 Wickson Hall
752-1544

The Water Resources Center is a Systemwide organized research unit charged with coordinating water resources research on the UC campuses. Through University research funds and funds from the Office of Water Research and Technology, U.S. Department of the Interior, the Center supports selected research in such areas as agricultural sciences, biological sciences, economics, engineering, history, geography, law, meteorology, physical sciences, and political science.

Research interests include water resource systems engineering, economic evaluation of water development and conservation, political strategy in water resource development, environmental and energy relationships in water resource management, watershed hydrology,





ground water use, soil and land use management in relation to water resource use, and maintenance and improvement of water quality.

Facility for Advanced Instrumentation

9 Hutchison Hall
752-0284

The Facility provides and maintains sophisticated equipment for campus investigators. Equipment includes transmission electron microscopes, scanning electron microscopes, electron microprobe, mass spectrometers, a programmable spectrophotometer, an image analyzing computer, amino acid analyzers and sequencer, and a variety of instruments for biochemical analysis. The staff trains those members of research groups who have not had experience in preparatory techniques and are also available as consultants for research projects.

Institute of Ecology

2132 Wickson Hall
752-3026

Established in 1966 as an organized research unit, the Institute fosters ecological and environmental research, provides intellectual leadership in ecology, administers resources and facilities, provides information on extramural support of ecological research, and maintains liaison with governmental and private organizations interested in funding ecological and environmental research.

The Institute has three publications series and sponsors national and international activities, including organizing symposia and conferences. It provides grants to support collaborative research in ecology among faculty members at UCD, and through these grants provides financial assistance to undergraduate students and graduate research assistants. The Institute's Cooperative Resources Studies Unit, supported by an agreement with the National Park Service, sponsors and administers research in the national parks of California.

Cooperating in the Institute's investigations are more than one hundred faculty members from all the schools and colleges on the Davis campus.

Institute of Governmental Affairs

Shields Library
752-2042

The Institute was established in 1962 to foster research in public affairs and government. The proximity of the Institute to Sacramento has led to a research orientation toward the problems and processes of state and local government in California. The staff works closely with social science faculty and students on this campus in conducting and supporting research on such topics as

the California Legislature, environmental regulation and growth control, policy and government in small communities, and political leadership.

IGA activities include an active publication program; the preparation and administration of grant proposals for extramural funding of social science research; a specialized library of published and fugitive materials which is open to faculty, students, and other users; the Social Science Data Service; the training of graduate and undergraduate students in research methods through participation in faculty-led projects; and the conduct of policy workshops and conferences.

There are so many things going on here that I'm afraid even when I graduate I'll still feel like I've only started to explore it all.

— Senior, Biological Sciences

Institute of Marine Resources

Temporary Building 186
752-2506

This statewide Institute was organized in 1955 with headquarters at La Jolla. The marine food science component of the organization was located on the Berkeley campus, but in July 1970 it was transferred and became part of the Department of Food Science and Technology at Davis. The staff studies factors affecting the chemical, biochemical, microbiological, and nutritional properties of fish and other seafoods. Current studies include those dealing with comparative biochemistry of hemoproteins, the use of modified atmospheres for storage of seafood products, crustacea nutrition, improvement of a chitinase-producing microorganism as part of a project dealing with shellfish waste, and extracellular enzyme production by a hydrocarbon-utilizing yeast.

Bodega Marine Laboratory

Box 247
Bodega Bay, California 94923
(707) 875-3511

The Bodega Marine Laboratory is designed to support research and teaching in the marine sciences. Located on Bodega Head, adjacent to the town of Bodega Bay in Sonoma County, the property consists of 327 acres fronting on both the ocean and Bodega Harbor. The property is treated as a biological refuge and is part of the UC Natural Land and Water Reserve System. Its mile-long ocean frontage is protected as a California Marine Life Refuge.

Comparative Oncology Laboratory

Armstrong Tract
752-2597

The Comparative Oncology Laboratory is a virus research facility funded primarily by the National Cancer Institute. The program was initiated in 1969 to study the relationship between viruses and cancer in animals. Currently, major emphasis is on the study of viruses



from tumors in higher primates. The program includes *in vivo* and *in vitro* studies to define the role of viruses in the induction of cancer.

Crocker Nuclear Laboratory

Crocker Nuclear Laboratory
752-1460

This facility was established by the University in 1965 as 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, and neutron structural damage studies. Isotopes produced by the variable-energy 76-inch cyclotron are used in clinical and research applications. Teaching activities at the undergraduate, graduate, and post-doctoral levels are in biology, medicine, radiochemistry, and physics.

Laboratory for Energy-Related Health Research (LEHR)

Laboratory for Energy-Related Health Research
752-1340

The Laboratory performs research on biomedical/health effects of exposure to effluents and emissions related to fossil fuel and nuclear energy production. Emphasis is on developing models for evaluating and understanding such effects on biological systems and

on determining the relationships between doses and effects. Funded primarily by the U.S. Department of Energy, the Laboratory has a staff of about 100 professional, technical, and support personnel.

Serology Laboratory

2116 Medical Sciences 1-A
752-2211

The Serology Laboratory was established in 1955 to acquire blood specimens for research and teaching programs in immunogenetics and to provide largely unique animal blood-typing services on request from registry organizations and private breeders. Its main objective is to pioneer in research on animal blood groups and biochemical polymorphisms, particularly those genetic markers which are effective and efficient in solving problems of questionable parentage arising in the breeding of registered animals.

The Serology Laboratory is a self-supporting activity funded by income generated primarily through agreements with various cattle and horse breeding organizations in the U.S. and Canada. The Laboratory is affiliated with the Department of Reproduction in the School of Veterinary Medicine. Its facilities are available for graduate and postdoctoral trainees.

Adult Fitness Program

Department of Physical Education
752-0637

The Adult Fitness Program is open to people from the University, the city of Davis, and surrounding communities. It provides members with a comprehensive physical fitness evaluation and an individualized exercise program for improving cardiovascular endurance fitness. The program is sponsored by the Department of Physical Education with considerable support from the Section of Cardiovascular Medicine, School of Medicine. Membership is unrestricted and participants may begin the program at any time during the year.

Emphasis is placed on the evaluation of cardiovascular fitness and health and on the assessment of body fat proportion by under-water weighing. Participants receive individual counseling for exercise training, weight control, and preventive medicine in general. Supervised exercise sessions include walking, jogging, swimming, and cycling. A cardiac rehabilitation program is offered to patients with coronary heart disease and to individuals who have a high risk for developing heart disease.

Special activities of the Adult Fitness Program are offered to University students and employees. These low-cost activities give participants an opportunity to have their body type and fatness determined, with personal counseling on how to achieve a desired body weight through proper nutrition and exercise. A "Shape-Up" program for students is open at the beginning of each quarter and includes supervised exercise sessions.

Agricultural Alternative Development Program (Student Experimental Farm)

Information:
College of Agricultural and Environmental Sciences
752-7645

This program was initiated in the summer of 1977 following several years of courses, discussions, and analysis of "alternative agriculture" and its importance to the College of Agricultural and Environmental Sciences. The Student Experimental Farm is an innovative research facility run by the students on 18 acres of University land. Students participate as volunteers, work-study interns, and Research Associates. Its purpose is threefold, as (1) an educational adjunct to the curriculum providing graduate and undergraduate students with the opportunity to design, conduct, and analyze their own field experiments; (2) a research and development program for conducting valid scientific research in small-scale and alternative technologies; and (3) a small farm and urban garden extension service.

Carnegie Institution of Washington, Department of Embryology, Davis Division

Temporary Building 160
752-0210

The world-renowned embryological collection founded in Baltimore in 1914 by Franklin P. Mall, and the later collections of Hertig, Rock, Hartman, and Bluntschli, are now housed at UCD. In addition to the microscope slides, photographs, and reconstructions showing human development, the collection includes insectivore, prosimian, platyrrhine, and catarrhine embryos.

The resources of this department are available to qualified investigators studying normal and abnormal primate development, on application to the Director.

UC Natural Land and Water Reserves System (NLWRS): Cold Canyon Reserve

Information:
Natural Land and Water Reserves System
Room 544
2111 Bancroft Way
Berkeley, CA 94720

Professor Peter B. Moyle
Department of Wildlife and Fisheries Biology
67 Briggs Hall
UC Davis
752-2739

The University of California administers some 25 natural reserves throughout the state. These reserves comprise a representative cross-section of California's diverse ecosystems and include deserts, off-shore islands, mountains, and even submarine canyons. Unlike parks or wilderness areas, the reserves are devoted entirely to teaching and research purposes and are not available for recreation. Since 1965, when the program was initiated, the University, using non-state

funds, has been protecting these carefully selected sites which might otherwise have become unavailable for scientific study.

In 1979, the University purchased the Cold Canyon property, 277 acres of wildland near Lake Berryessa (about 14 miles west of campus), as part of its Natural Land and Water Reserves System. The Davis campus has administrative and management responsibility for the reserve, which will be maintained in its present natural state and be available for teaching and field research by scientists and students at UC Davis and other universities.

Terrain and rainfall patterns of the Cold Canyon area support examples of several different plant communities found in both the inner and outer coast ranges, and the property is now being used by botany students studying California plant life and by ornithology students studying birds in the area.

Davis is a great place to be during the summer — nice and mellow. — Senior, American Studies

ADDITIONAL ACADEMIC RESOURCES

DIVISION OF EXTENDED LEARNING

Information:
376 Mrak Hall
752-2820

The Division of Extended Learning extends the knowledge, teaching, research, and cultural resources of the University to the citizens of northern California through University Extension, Summer Sessions, Committee for Arts and Lectures, Conferences and Campus Services and the Kellogg Program.

University Extension

Information and catalogs
4485 Chemistry
752-0880

The free quarterly University Extension catalog, *Venture*, contains the current list of continuing education programs offered to individuals in 29 northern California counties. Enrollment is open to the general public. No formal admission to student status is required to take advantage of the wide variety of stimulating programs.

Fields covered by Extension courses, both credit and non-credit, include public administration, business management, environmental studies, data processing, wilderness recreation, alternative technology, engineering, labor relations, liberal arts, education, nursing and allied health sciences, veterinary medicine, and agricultural sciences.

Programs vary in length and format, from one-day conferences and short lecture series to certificate programs requiring attendance for several quarters. Classes are held both on and off campus. Instructors are drawn from the University, nearby college faculties and professionals, and internationally known experts.

Tuition fees and charges enable University Extension to function as a financially self-supporting enterprise.

Summer Sessions

Information:
376 Mrak Hall
752-1647

Summertime means vacation time. But it can also mean a time for students to accelerate progress toward a degree (attending both sessions can result in completion of a quarter's work) — or work on a teaching credential — or take advanced special study, research, or group study courses.

Summer Sessions at Davis offer a variety of lower division, upper division, and graduate courses that provide full University credit. Admission is open to all University students, high school graduates, and qualified applicants. Please note, however, that admission to a Summer Session does not constitute admission to the University's regular sessions. For the Summer Sessions bulletin and application materials, write to the address above.

In 1981 there will be two six-week Summer Sessions at UC Davis: June 22 through July 31, and August 3 through September 11. UCD Summer Sessions also offers two special six-week programs: one at the University of Edinburgh, Scotland, from July 13 to August 22, and the other in Washington, D.C., from June 22 to August 1.

Committee for Arts and Lectures (CAL)

Information:
104 Freeborn Hall
752-2523

The Committee for Arts and Lectures presents cultural events to enrich and supplement the educational experiences of campus and community members.

In 1980-81 CAL will be presenting music and dance concerts, films, plays, poetry readings, lectures, solo recitals, orchestral performances, and free noontime entertainment on the Quad.

Student tickets are available at reduced prices for events for which there is a charge.

The Committee, which is composed of students, faculty, and staff members, welcomes program suggestions and interested volunteers.

Conferences and Campus Services

Information:
Conferences and Campus Services Office
4475 Chemistry Annex
752-2813

Off-campus and non-student campus groups desiring to use campus facilities to sponsor meetings, workshops, conferences, or similar activities should contact Conferences and Campus Services. A one-stop res-



ervation service, this office provides a single location for assistance with arranging all the various components of meetings and conferences.

Kellogg Public Service Research Program

Information:
376 Mrak Hall
752-3224

"The University and Public Policy: New Models for Communication, Action and Change" was developed on a grant to UCD from the W.K. Kellogg Foundation. The program provides the opportunity for faculty members to undertake collaborative research projects with public agencies on issues of public policy. It also encourages the dissemination of research information on public policy issues through publications, policy conferences, and workshops.

One result of Kellogg Program activities is a network of resources which helps to improve access to University research and contributes to a better understanding of public policy issues.

WORK-LEARN INTERNSHIPS

Information:
Work-Learn and Career Planning and Placement Center
2nd floor, South Hall
752-2855

Where are you going?

That is sometimes hard to answer in today's complex world. You may need to clarify your personal or educa-

tional goals. Or expand your awareness of the "working world." Or find out if you are really interested in a career in business, research, teaching, or agriculture.

One way to help yourself make these and other important decisions is to participate in a work-learn internship. Work-learn expands your learning beyond the classroom and enables you to make better decisions about your future by helping you to assess your skills, explore career opportunities, and secure on-the-job experience.

Here is how it works: participation may be full-time or part-time, credit or non-credit, voluntary or with a salary — depending on your needs and interests and the availability of opportunities. The work-learn experiences must emphasize learning rather than routine activities, 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.

You can initiate an internship on your own, or take advantage of the organized programs at Davis which include internships-in:

- agricultural and environmental sciences
- engineering and physical sciences
- health and biological sciences
- liberal arts and education

In either case, a notation describing the internship can be made on your transcript by obtaining prior approval from the Work-Learn Office.

Internships, work experience, and special projects have been some of the most enjoyable parts of my years at Davis.
— Senior, Applied Behavioral Sciences

EDUCATION ABROAD

Information:
Education Abroad Program Office
323 South Hall
752-3014

Academic Advice:
H.J. Ketellapper, Campus Coordinator
Dean's Office, College of Letters and Science
752-0392

The United Kingdom, Japan, Sweden, Norway, Mexico, Brazil, Hong Kong, Ireland, Egypt, France, Austria, Germany, Italy, Israel, Spain, Kenya, Peru, the USSR, and West Africa.

An around-the-world itinerary for madcap travelers? No. These are the places where you can study as a participant in the University's Education Abroad Program (EAP).

Most EAP experiences are for undergraduates for an academic year. An exception is the one-semester program in Leningrad (USSR).

Graduate students who have completed at least one year of graduate work at the University and have the support of their department and the Graduate Division are also eligible for some EAP programs.

The primary purpose of EAP is to provide an academic experience in a different educational system. For the most part, UC students abroad live as do students at the host university, attend the same classes, take courses from the same professors, and take part in local social and cultural activities. Full UC unit credit is given for courses satisfactorily completed.

Eligibility requirements include:

- At least 84 quarter units completed by the time of participation
- At least a 3.0 GPA for coursework completed in the University of California at the time of application and departure
- 2 years of University-level foreign language, or equivalent, with a 3.0 GPA (not applicable where classes are in English)
- An academic plan approved by your major adviser and the campus coordinator
- Endorsement of the Academic Senate Committee on the Education Abroad Program

To help overcome "culture shock" and prepare you for your academic schedule, University of California professors administer intensive language and orientation programs at many overseas campus locations. Moreover, should any personal or scholastic problems arise during your study abroad, the faculty members will be there to assist you.

Estimated minimum costs for the nine-month program range from \$4,300 to \$7,250.

For study abroad during the 1981-82 academic year, the application deadlines are November 7, 1980 for the United Kingdom and Ireland and January 23, 1981 for



all other study centers. If you intend to participate during your senior year, careful advance planning is necessary to make sure that all degree requirements will be met. (See also page 60.) Consult with your major adviser, the Dean's Office of your college, and the Campus EAP Coordinator. See page 178 for information on EAP centers and study programs.

You can obtain informational brochures on other opportunities for study, travel, and employment abroad from the Education Abroad Program Office.



UNIVERSITY PROFESSORS

One of the University's valuable and unique resources is its small roster of University Professors appointed by The Regents upon the recommendation of the President of the University. The title is reserved for certain distinguished faculty members, recognized nationally and internationally as scholars and teachers of exceptional ability. Each University Professor has a home campus but may hold a joint appointment on another campus. All are available to other UC campuses for limited or extended visits, primarily for teaching and lecturing. A University Professor may visit a number of UC campuses during the academic year, holding conferences with students and staff and speaking before general public audiences. Arrangements for a visit by a University Professor are made directly by deans and department chairpersons with the University Professor concerned. A small fund, part of the Intercampus Exchange Program budget, helps defray the University Professor's travel expenses.

At present, the roster includes:

University Professor, Emeritus, Melvin Calvin
Lawrence Berkeley Laboratory
UC Berkeley

University Professor Murray Krieger
Department of English and Comparative Literature
UC Irvine and UC Los Angeles

University Professor, Emeritus, Josephine Miles
Department of English
UC Berkeley

University Professor, Emeritus, Glenn Seaborg
Department of Chemistry
UC Berkeley and Lawrence Livermore Laboratory

University Professor Neil Smelser
Department of Sociology
UC Berkeley

University Professor, Emeritus, Edward Teller
Lawrence Livermore Laboratory
Livermore, California

University Professor Charles Townes
Department of Physics
UC Berkeley

University Professor, Emeritus, Harold Urey
Department of Chemistry
UC San Diego

University Professor, Emeritus, Sherwood Washburn
Department of Anthropology
UC Berkeley

University Professor, Emeritus, Lynn White, Jr.
Department of History
UC Los Angeles



Student Life

LIVING ACCOMMODATIONS

Residence Halls

Information:
Student Housing Office
752-2033

You can expand your UC Davis experience and add a measure of convenience to your life by living on campus; some 2,900 undergraduates and 180 graduate students do just that. Each of the residence hall complexes is staffed with students and professionals who help create and maintain an environment conducive to personal growth and educational achievement.

The total room-and-board rate for 1980-81 is \$1,990 for a double-occupancy room and \$2,155 for a single room (of which there are very few available to new residents). These rates include local telephone service and 19 meals per week. Rooms come complete with furniture, study lamps, and private telephone. Students must provide their own linens and towels.

If you check "University Operated Housing" and request the Davis campus as your first choice when filling out your University Admissions Application, the necessary information and applications are mailed to you by the UCD Undergraduate Admissions Office. Students redirected to UC Davis from another UC campus should immediately contact the UCD Housing Contracts Office to obtain a housing application.

Student Family Housing

Information:
Student Family Housing Office
Orchard Park
752-4000

There are 476 apartments on campus for married students and single parents. Both furnished and unfur-

nished apartments are available. Sorry, pets are not permitted.

Considering that apartments in the Davis community generally cost \$70 to \$160 more per month than student family housing, you can see why on-campus apartments are assigned only from a waiting list. Since a wait of 6-8 months for a Fall Quarter assignment is common, your application may be submitted prior to admission to UCD.

Rents for 1980-81 (including all utilities except telephone) are:

- 1-bedroom unfurnished, \$144/month
- 2-bedroom unfurnished, \$163/month
- 2-bedroom furnished, \$195/month (air conditioned)

Community Housing

Information:
Student Housing Office
752-2483

If you choose to live off campus — about 75 percent of UC Davis students do — the Community Housing Office will probably turn out to be a very valuable resource. Many special programs, including grievance counseling and roommate selection services are provided. Useful publications, such as *A Delicate Balance — Your Rights and Responsibilities*, leasing information, and the Davis Model Lease, are also available here.

In addition, the Office maintains listings of private rooms, apartments, mobile homes, and houses for rent in the Davis area, as well as "roommates wanted" and "roommates available." Because the listings change from day to day, however, prepared lists are not furnished by mail.



Independent living groups — fraternities and sororities — are among your other housing options. Such groups offer an opportunity to participate in a self-governing residential environment where maintenance, food preparation, social planning, and educational activities are shared by the members.

THE ARTS AT DAVIS

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

The Department of Music sponsors the University Symphony, Chorus, 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 Music Department also sponsors an artist-in-residence for one quarter each year who gives concerts, recitals, and lectures, and who works with music classes and individual students. Free noon concerts featuring individual performers and ensembles — both professional musicians and music students — are a favorite weekly event during the school year.

The Dramatic Art Department has one of the best theatre facilities in California. The excellent faculty and special guest artists, the presence of graduate students working on Master of Fine Arts (MFA) degrees in acting, directing, writing, and technical theatre, and an unusually good stock of scenery, props, costumes, and lighting equipment all contribute to the professional quality of Davis productions. Each year's dramatic schedule includes the University Theatre Season (five major productions of established plays); one major



production of an experimental piece; the Premiere Season (five smaller productions of plays written by students); Studio Season (three smaller productions of established plays); 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.

A tour of all the UCD art galleries will take you from one corner of the campus to the other. The **Memorial Union Gallery** (725-2885) has two exhibit spaces and features eighteen exhibits a year. The Gallery shows are organized by part-time student managers and include works by professional artists in solo and group shows.

The **Richard L. Nelson Gallery** (752-0105), 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 of high quality and rich variety 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. The Nelson Gallery space includes the Main Gallery, which features sculpture and painting, and the Small Gallery, which features photographs and prints. The **Basement Gallery** (752-0105) in the Art Building shows work by undergraduate UCD art students.

The **Carl N. Gorman Museum** (752-6567), established in 1973 in honor of Carl Gorman, an advocate of Native American Studies at UCD, features professional Native American artists. The museum has a permanent collection as well as exhibits that change throughout the year. The **Design Galleries** on the first floor of Walker Hall, and exhibit spaces in the College of Agricultural and Environmental Sciences Office (228 Mrak Hall), the Faculty Club, and AOB-IV, feature the work of students and faculty members in the Design program. Exhibits in the **Anthropology Museum** (138 Young Hall), are oriented toward areas of graduate and faculty research interest. Various collections include artifacts from North America, the South Pacific, and Africa. Exhibits are mainly Department collections, with some works on loan from other galleries.

The Committee for Arts and Lectures (CAL) brings a wide variety of performing groups to campus, in addition to sponsoring lectures, film series, and free noon-time events on the Quad. Various departments, such as English, the foreign languages, and History, sponsor lectures, poetry readings, and exhibits open to the University community. The *Campus Record*, a weekly information sheet published by the Office of Public Affairs (334 Mrak Hall, 752-1930) lists most of the



week's activities, but bulletin boards, kiosks, the student radio station KDVS, and the *California Aggie* also advertise upcoming events.

On the lighter side, the Cal Aggie Marching Band entertains spectators at UCD football and basketball games, and sometimes even shows up at tennis matches. A special group which defies all categorization, the Band is noted for its colorful performances and is one of the last remaining student-funded and student-run marching bands in the country.

RECREATIONAL FACILITIES AND PROGRAMS

No matter what your recreational bent — horseback riding, dancing, music listening, chess, crafts, bowling, woodworking, swimming, or sports — Davis has a place where you can enjoy it.

How about intramural sports? The Intramural Recreation Program is one of the most popular programs on the Davis campus, a great way to relax and have fun. More than 50 different activities, from coed inner-tube water polo (created on the Davis campus in 1969) to lacrosse, are available year-round. Whether the action takes place in one of several gymnasiums, the Rec Hall, the track at Toomey field, Memorial Union Games Area, the tennis courts, or the swimming pool, participation is always lively and informal.

Memorial Union

Information:
Coordinator, MU Business Services and Facilities
462 Memorial Union
752-2524

Coordinator, MU Programs and Campus Recreation
465 Memorial Union
752-1730

The **Memorial Union** (MU), at the north end of the Quad, is the hub of campus activities. Bring yourself up to date on local events by stopping at the Information Desk in the main lounge, or by calling 752-2222. In the

When you have a choice between four movies, a jazz concert, a recital by the Early Music Ensemble, a lecture on breakthroughs in cancer treatment, a trip to the mountains, San Francisco, Lake Tahoe, or Putah Creek, how can you go wrong?



MU you'll find the Games Area (with 16 bowling lanes, a billiards room, a card and TV room, and game machines), the Campus Box Office, and **Freeborn Hall**. Freeborn is a 1,800-seat assembly hall used for dances, banquets, dramatic and musical events, lectures, and conferences. Located in lower Freeborn is the Student Organizations and Activities Center (SOAC), KDVS radio, the *California Aggie* newspaper, Rabbit Reproductions, Experimental College, Switchboard, Zapple Records, Classical Notes, and the MU Barbershop. Also housed in the MU complex are the Committee for Arts and Lectures, the UCD Bookstore and Corral, the Coffee House, MU Dining Commons, The Last Resort Restaurant and Pub, MU Listening Lounge and Library, music practice rooms, lounges, outdoor plazas, Associated Students offices (including the travel service), the Graduate Student Assembly (GSA) Office, the MU Art Gallery, MU Recreation offices, and meeting rooms. In addition to these programs and services, the MU staff coordinates the following facilities and programs outside the MU complex:

The **Putah Creek Recreation Area** and the **Arboretum** feature picnic areas, bicycle and walking paths, bridle paths, and a small lake. Surrounded by a grassy area suitable for group recreation, the Putah Creek Lodge has outdoor barbecue pits and tables as well as an indoor fireplace, kitchen, and multi-purpose room. The Arboretum along Putah Creek is planted with trees and shrubs from California and many other parts of the world for teaching and research activities, as well as for general enjoyment.

Memorial Union and Recreation Services maintains the tennis courts on La Rue Road, just north of the Recreation 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 when not being used for campus programs. No reservation is required as the courts are available on a first-come, first served basis.

The **Recreational Swimming Pool Complex** includes a large free-form pool with separate wading pool, bath house, snack bar, and shuffleboard courts. The adjacent lodge is equipped with a kitchen, meeting rooms, and a lounge with a large fireplace.

The **Silo Barn Student Center**, built in 1908, was once billed "The World's Most Modern Dairy Barn." The barn was renovated in 1970 and now features a snack bar, games facilities, a large multi-purpose room, and offices for Student Special Services. The **Silo Craft Center** is an ideal place to channel your creative energy. Facilities are available on a drop-in basis, and workshops and classes are offered each quarter in such varied crafts as woodworking, weaving, spinning, jewelry making, batik, ceramics, photography, silk-screening, leatherworking, upholstery, and more.

Spring comes suddenly to Davis. One day the winter clouds are gone, the air turns warm and everyone is outside having a good time.
— Sophomore, Mathematics



The **Equestrian Center**, southwest of the Veterinary Medical Teaching Hospital, is active all year round. Trail rides and instruction in both English and Western riding are available for beginning through advanced riders.

The **Outdoor Adventures** program is located in Temporary Building 24 (across from Chemistry 194). Outdoor Adventures operates a rental outlet and resource center, and provides classes and clinics in backpacking, rock climbing techniques, white water rafting, mountaineering, cross-country skiing, and equipment construction . . . to name just a few.

Recreation Hall

Rec Hall Office
Entrance 1B
140 Recreation Hall
752-6071

The Recreation Hall on the Davis campus is a multi-use facility for intramural and informal recreation play, intercollegiate athletics, and special events. The three-level hall has locker rooms; an equipment room; handball, racquetball, and squash courts; a weight room; I.C.A. training and team rooms; an arena area for volleyball, basketball, and badminton courts; areas for wrestling and combative sports, table tennis, gymnastics, and dance; and informal recreational play areas.

Students can use Rec Hall facilities by showing their current Registration Card. Faculty, staff, alumni, and community members may purchase privilege cards to use Rec Hall lockers, equipment, and facilities. One-day passes may also be purchased at the door. Copies of the brochure *Rec Hall Activities* are available from the Rec Hall Office and at the Memorial Union Information Desk.

The Rec Hall is also available to campus affiliated organizations for special events.



ASSOCIATED STUDENTS (ASUCD)

Information:
ASUCD Office
3rd floor, Memorial Union
752-1990

The Associated Students of the University of California, Davis (or ASUCD) is the student organization to which every registered undergraduate belongs. Out of the \$256.50 undergraduates pay each quarter \$10 goes to ASUCD. Graduate and professional students may become members by paying the \$10 fee although certain ASUCD services are available to these students from their membership in the Graduate Student Association or Law Student Association. The money is spent on activities and services that will make life as a student a little easier, less expensive or just more fun — such as the Coffee House, the campus newspaper, radio station, record store, note-taking service, the Experimental College, the Academic Grievance Center, and more.

The student government, which controls how and where the money goes, is run by the ASUCD Executive Council. The Executive Council is based on the city council form of government and consists of six elected council members and the Council President. It is the policy-making body for ASUCD and oversees every aspect 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 keeps the student body in contact with other universities, the University systemwide administration, The Regents, and the Davis city government.

Four commissions deal with making recommendations to the Executive Council. Members of the commissions are appointed by a subcommittee of the Executive Council. The four commissions are as follows:

External Affairs deals with off-campus concerns (city of Davis, The Regents, social responsibility, agricultural mechanization impact, etc.).

Campus Life is concerned with nominating students to the Chancellor's Administrative Advisory Committees, as well as monitoring campus issues.

Academic Affairs acts as an advocate of 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 deals with the allocation of student monies to services and activities as well as to the annual ASUCD budget.

The judicial branch consists of the Student Judicial Board whose members are appointed by the President of ASUCD.

ASUCD operates more than fifty activities and services for UCD students. Information about these services can be found in a new publication which combines *Student Viewpoint* with the *ASUCD Catalog of Services and Organizations* and the *Student Directory*, or by visiting the ASUCD offices in the Memorial Union.

Some of the ASUCD services include the Unitrans bus system, *California Aggie* newspaper, *Student Viewpoint* evaluation of professors and classes, the Bike Barn repair services, free legal services, and the Coffee House in the Memorial Union. The ASUCD-sponsored Experimental College offers a variety of nontraditional classes each quarter for students interested in diversifying their educational experience. Other ASUCD activities include Radio KDVS stereo FM and AM, the Cal Aggie Marching Band, Student Forums, Entertainment Board, Zapple Records, and Picnic Day. ASUCD also cooperates with Associated Student groups on other University of California campuses to operate a full-time Student Lobby in Sacramento to represent student interests to State government.

STUDENT ORGANIZATIONS AND ACTIVITIES CENTER (SOAC)

Information:
SOAC Office
10 Lower Freeborn Hall
752-2027

At UC Davis there are over 300 recognized student organizations with a total of 18,000 members, representing political, religious, social, cultural, ethnic, academic, recreational, international, and service interests. The Student Organizations and Activities Center is a resource staffed by professionals in student development and higher education. The Center provides advising on activities and campus policies, support services, and leadership training to help campus organizations increase their effectiveness. SOAC also assists individual students who want to get involved in new activities or to start new organizations. Members of the campus community can pick up quarterly Film Calendars at SOAC and obtain information about campus activities by contacting the SOAC Office and attending the Fall SOAC Activities Faire. To reserve

campus facilities (recreation lodges, meeting space, etc.), student groups may contact the SOAC Reservations Manager at 752-1920.

ADVISING AND COUNSELING

In many ways, good advising is as important as good teaching. Several sources of advising and counseling—both academic and personal—are available to students at Davis. You may never need some of these services, but you'll be missing out on some important opportunities if you don't give them a try.

Advising Services

Information:
109 South Hall
752-3000/2022

Advising Services coordinates the student service groups listed below. Professional staff and more than 60 student advisers are available to help you with your immediate concerns and with plans and possibilities for your future.

Academic Peer Advising places peer advisers in more than twenty 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 South Hall, 752-3000.

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 academic 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 also maintains a tutor listing and referral service for use by all students. If you have a problem, remember—start with the *First Resort* (TB-115, corner of Peter J. Shields and California Avenues, 752-2807).

The **Orientation and Summer Advising Office** provides coordination for the Summer Advising and Registration Conference, "O" Week (orientation) activities, Preview Day, and many other student assistance and orientation programs for new students. The staff seeks to help students learn about the campus environment, procedures, and opportunities, and to offer 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 South Hall (752-3000).

The **Pre-Business School Adviser**, 359 Kerr Hall (752-6512 or 752-3000), is a student peer adviser who can assist you in seeking information about graduate

It's nice to get involved in my classes, but I have to keep reminding myself to take time off for me, and all the things I like to do.
— Junior, Human Development





schools in business and management. This office also works with students who are in the process of applying to graduate school in business and distributes the Graduate Management Admission Test (GMAT) booklet. There is a useful library of business school catalogs and an informational handbook available.

The **Pre-Law Advising Office** is the place students interested in legal careers 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. Many seminars and workshops are also held each year to provide students with more information for preparation for law school and a legal career. The Pre-Law Adviser may be contacted in South Hall, 752-3009.

The **Health Sciences Advising Office** (1st Floor South Hall, 752-2672) will be an important place for you if you are considering a career in the health sciences. The professional staff and student advisers can provide information on requirements, application procedures, professional school curricula, and career options. The office maintains an extensive library of school catalogs, statistics, and books and journals related to health care and careers.

Counseling Center

Information:
219 North Hall
752-0871

The Counseling Center is a place where you can receive individual support and attention with concerns about interpersonal relations or questions such as choosing an academic major or vocation. It is a place where individuals can explore their feelings, values, and concerns in an atmosphere of understanding and confidentiality.

In addition to individual counseling, the Counseling Center offers group counseling, vocational interest testing, personality testing, information about graduate school admissions tests, and counseling for EOP students. The Center also helps students wishing to participate in the Planned Educational Leave Program clarify their reasons for temporarily leaving the University.

The Counseling Center is staffed with psychologists and counselors who provide services to students directly and work as consultants, trainers, and advisers to other groups and agencies within the campus community.

Students can see counselors immediately through the walk-in service or can make an appointment to fit their schedules.

The House

Temporary Building-16 (next door to Housing Office)
24-hour hotline: 752-2790
Information: 752-5665

The House is a 24-hour peer counseling center which offers a comfortable, supportive, non-judgmental environment for UCD students who wish to explore personal issues and interpersonal problems. Student volunteers are trained to provide counseling, support, clarification, information, and appropriate referrals. Through supportive intervention we hope to help students improve their problem-solving, coping, and personal growth abilities.

The House also offers a variety of workshops and groups, training in basic counseling and communication skills, and free tea and coffee.

Counseling services are available on a drop-in or phone basis. The Center is open seven days a week and is accessible by ramp. Counseling is provided for on-going problems as well as crisis situations, and all services are confidential. The House is a student-funded student service. Use us!

The most important thing to remember about studying is that to do it well you have to practice. It's a skill, like anything else, and it takes some time to get good at it. NOBODY was born knowing how to do calculus.
— Senior,
Mathematics



Educational Opportunity Program (EOP)

Information:
EOP Information Office
311 North Hall
752-3472

The EOP Information Office is an important unit of the Counseling Center and its primary goals are to assist students with their academic, social, and personal adjustments to the University environment; to collect and disseminate information about students' needs; to serve as a liaison between students, staff, faculty, and administration; to coordinate EOP orientations; and to provide training and experiences for students who are pursuing the "helping" professions.

The peer staff of this office is an invaluable academic resource for students and is particularly sensitive to the social, cultural, and ethnic background and concerns of EOP students.

The Information Office is very concerned about making counseling and advising more open to the immediate needs of students and the staff is involved in "outreach" activities throughout the campus. So feel free to stop by the main office (address above) or telephone to find out more about the available services.

We are here to serve you!



EOP Tutoring (Learning Skills Center, Temporary Building-10, 752-2013) is a free service for EOP students. If you are having difficulty with your course work, the Learning Skills Center offers tutoring in several course areas. Tutoring is provided on a one-to-one basis, with primary emphasis on the assignments in classes you are taking. However, tutorial services may also be used to improve study habits and learning skills. The tutoring program is staffed by EOP and non-EOP students, most of whom are undergraduates who have taken the classes in which they tutor.

Special Transitional Enrichment Program (STEP) (Learning Skills Center, Temporary Building-10, 752-2013). New EOP students (freshmen and transfers) admitted by special action are expected to participate in the Special Transitional Enrichment Program (STEP). The program begins in summer and continues through the first academic year, providing preparatory course work and developing academic skills. By supplementing regular academic courses, the program 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 Skills Center (LSC)

Information:
Temporary Building-10
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 and speed
- English as a second language
- Time-management
- Test-taking



- Test anxiety reduction
- and many more . . .

In addition to the above assistance, the Center provides tutoring sessions, individual and group, to various segments of the student population: members of the underrepresented ethnic groups, handicapped students, veterans, and students on academic probation or subject to dismissal.

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 which enable you to work at your own pace. The LSC Library contains a variety of programmed instructional materials, reference books, and preparation materials for the GRE and LSAT exams, many of which may be checked out.

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

Academic Reentry Program

Information:
175 Mrak Hall
752-2971

If you are a nontraditional student, you can find help through the Academic Reentry Program. Preadmission and reentry advising are offered. The Office's resource area contains information on major programs, and staff is available to discuss ways of combining past study



with future academic and career goals. Referrals to major advisers and campus services are included.

Once admitted, the campus provides additional assistance with an orientation to campus life through Advising Services and study skills workshops offered by the Learning Skills Center.

The Counseling Center provides continuing support with noon-group sessions for discussions and information sharing. *Continuum* is the reentry student newsletter.

STUDENT SERVICES

Student Health

Information:
Cowell Hospital and Student Health Center
752-2300

Your health is important to you and to the University. Consequently, every new full-time student and every full-time student who returns after an absence must file, in person, a medical history form and the results of a tuberculin skin test at the Health Center as part of



registration. A medical evaluation of the information on the form is then made in order to safeguard your health and the health of the University community.

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. Applicants with contagious diseases will be excluded from the classroom.

The services of the Health Center are made possible, for the most part, by your registration fees. As a regularly enrolled student paying full registration fees, you are entitled to such outpatient and inpatient medical care as the Health Center is staffed and equipped to provide 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 and hospital care
- 24-hour emergency service
- Regularly scheduled clinics
- Major and minor surgery facilities
- An intensive-care unit
- X-ray, laboratory, and pharmacy services
- Physical therapy facilities
- Contraceptive information

The Health Center does not assume the responsibility for treating chronic physical defects, illnesses present



at the time you enter the University, dental problems, or non-emergency remediable disorders.

When, in the opinion of the Health Center's Director, a serious illness or injury obviously prevents you from



continuing class work during the current quarter, you will be returned to your community or home for definitive treatment.

If you are not enrolled during a quarter, or if you spend the summer in the Davis area, you can maintain your Health Center eligibility by paying an appropriate fee. Enrollment in this program can be initiated only during the registration period for each quarter or summer session.

The facilities of the Health Center are open to your dependents on a fee-for-service basis. A Dependents' Health Insurance Plan for your spouse and children can be purchased at the beginning of each quarter in the Health Center.

International Student Services

Information:
Services for International Students and Scholars
3rd floor, South Hall
752-0864

The UC Davis campus currently has a community of international students and scholars from 96 different countries studying, teaching, and researching in a wide variety of fields. Assistance for international persons on campus is provided by the staff of Services for International Students and Scholars (SISS).

The primary function of the SISS Office is to assist incoming international persons in obtaining proper visas and then maintaining their status after arrival. The Office also provides financial information, advising and counseling services, orientation, and intercultural activities.

Prior to Fall Quarter registration, a special orientation is held for new international students. All new and transfer international students are urged to attend this annual program which provides assistance with registration, class enrollment, housing, banking, cultural adjustments, and immigration regulations. Introductions to campus services and community resources are also provided.

Careful budgeting is essential for international students. A *minimum* allowance of \$380 per month for a single student and \$500 per month for a married student is recommended for living expenses. In addition, international students will require funding for tuition and

fees as nonresidents (see page 37) for the duration of their stay at UC Davis.

Additional funding will be required for books, laboratory equipment, instruments, dental and eye care, summer health insurance, health care of dependents, and Summer Session fees, as needed.

The international student should be cautioned that there will be numerous additional expenses during the first few months for deposits and cleaning fees for housing, telephone installation costs, and purchase of bedding and cooking utensils.

No financial aid (loans, grants, or scholarships) is awarded by the University to international students during their first year of study and no aid can be guaranteed in subsequent years. Prospective graduate students who have been corresponding with an academic department about a research or teaching assistantship should receive a clearly defined offer in writing before departing for Davis.

Students are encouraged to visit Services for International Students and Scholars as soon after their arrival as possible. If contacted in advance, the SISS Office can make arrangements to provide transportation for new students from the Sacramento airport to Davis. This office can help with immediate needs and assist in providing friendship by helping to locate fellow countrymen and introducing new students and scholars to Davis's international community.

Services to Handicapped Students

Information:
Services to Handicapped Students (SHS)
101 Silo
752-3184 or MCM 752-6TTY

If you are physically disabled or blind, you can draw upon the advice, assistance, resources, and experience available from Services to Handicapped Students. This resource program is designed to reduce the barriers that students with disabilities face at UC Davis. The staff of SHS are committed to working with you to accommodate your individual circumstances and know the needs and problems you face from their own experience on campus.

Most architectural barriers to participation in campus activities have been removed. There is now accessible on-campus housing, and a campus map showing special facilities is available. The campus is almost completely flat and has a good curb ramp system. This ease of mobility, plus special class scheduling methods, can better ensure that you'll make it from one class to another on time.

Advising is available to assist with such problems as living options, attendant recruitment and management, and adaptations for maximum independent living. Counselor and student peer support can help you on disability management issues, career choices, and personal development. You can also find assistance in obtaining financial aid to meet special needs.

Educational support includes specialized academic advising, emergency educational equipment loans, tutoring services, a library resource center with specialized equipment, and arrangements for locating and funding readers, interpreters, and clerical or research assistants. Other resources include:

- Priority registration and enrollment in classes



- Educational support equipment, including a reading machine, television aids for visually impaired, amplification equipment, speech compressor, etc.
- Orientation tours and mobility advising for maximum independence
- Repair services for wheelchairs and mobility equipment
- Emergency loan of electric carts and wheelchairs
- Transportation services in adapted vans.

Preadmission counseling is available to individuals with disabilities. You are encouraged to contact the SHS Office if the circumstances of a permanent physical disability seem to prevent you from demonstrating your ability to do University work or completing the subject or examination requirements for admission.

Veterans Affairs

Information:
Veterans Affairs Office
200 Silo
752-2020

As a veteran or veteran's dependent, you may be entitled to various benefits under state and federal laws. If so, the Veterans Affairs Office can assist you.

To initiate a benefit claim, write the Veterans Affairs Office or drop by 200 Silo with your letter of admission, preferably before registration. The office can give you forms, information, and advice, and will also certify your attendance to the Veterans Administration. Remember to visit the office each quarter (bring your validated



registration card for recertification) in order to avoid any delay in receiving benefits. If other delays occur, the office will help resolve the problem.

Other special services veterans and veterans' dependents may be eligible for are coordinated by this office. These include employment, financial aid, VA Work-Study, correcting military records, and tutorial assistance.

Selective Service Information

Information:
Student Special Services
200 Silo
752-2007/2020

The Office for Selective Service Information assists students who have inquiries and problems regarding their Selective Service status.

Students will find it to their advantage to continually keep themselves aware of Selective Service laws and procedures. Even during periods when induction is not in effect, draft-eligible students may still have legal responsibilities for registration and status changes. This Office provides individual advising and consultation on legal obligations and classification options and conducts group workshops in all areas relating to the draft.

If you are confused or unsure of your current selective service status, the Office can help by offering information, assistance, alternatives, and support.

Women's Resources and Research Center (WRRC)

Information:
Temporary Buildings — 116 and 124
752-3372

The Women's Resources and Research Center is a supportive place for women in all roles, with all kinds of needs and interests. WRRC's services are wide-ranging and include:

- Forums and workshops on subjects related to the status of women and the effects of changing sex roles on both women and men
- Academic advising and assistance in locating faculty supervision for 198, 199, 298, and 299 courses
- Internships in research, writing, legislative work, publicity, program planning, graphic arts, and other areas
- Limited career advising
- Resource files and referrals for birth control, marital problems, legal rights, legislation, child care, sexuality, mental health, health care, employment
- Consultation with other units
- Research on issues of concern to women
- Special interest discussion groups and consciousness-raising groups for both women and men
- Speakers Bureau

A library containing books and research materials on subjects related to women and changing sex roles, and a monthly newsletter, *Women's Writes*, are also services of WRRC.

The Center is staffed by professionals, student interns, and volunteers. People are encouraged to drop by and talk with the staff, and volunteers are needed to work with the Women's Center on public forums, resource updating, legislative research, publicity, and on the newsletter.

Student Employment

Information:
Student Employment Center
1st floor South Hall
752-0520

Need a part-time job to get yourself through school? Do you occasionally run short of funds or need a few extra

dollars for the special weekend event? Or are you looking for experience in a job that is related to your major? If so, the Student Employment Center can probably assist you.

The Center assists regularly enrolled students (including Part-Time Degree students), students on Planned Educational Leave, students' spouses, and students who have received a letter of acceptance for the following quarter but have not yet registered. The Center also coordinates the College Work-Study Program for eligible financial aid recipients.

A wide variety of positions on the campus and in Davis and adjacent communities are available. New listings are posted twice daily. Extensive listings of summer opportunities in government agencies, camps and resorts throughout California are located at the Center and students are encouraged to begin in January looking for summer employment.

The Center is open from 9 a.m. to 12 noon and 1 to 4 p.m.

- Part-time, full-time, school-year jobs
- Vacation employment

Career Planning and Placement

Information:
Work-Learn and Career Planning and Placement Center
2nd floor, South Hall
752-2855

Worried about your career plans? Do you know what kind of a job you want when you graduate? Or are you one of the many students unsure about the career you want after graduation? If so, the advisers in the Work-Learn and Career Planning and Placement Center may be able to help you.

The Center assists undergraduates, graduates, and alumni in skill assessment, development of career or employment goals and experience, and placement into full-time employment. 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.

Some of the resources you can find at the Center include:

- Individual career advising and group seminars
- Workshops on communication, interviewing, and job-seeking skills
- Seminars to explore career fields and employment trends
- A Career Resources Library
- A manual for job-seekers
- Listings of current job vacancies

The Career Resources Library has 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 graduated students have obtained (summarized by academic major). Useful to

job-seekers — and available free of charge — is the *Placement Manual*, prepared by the Center, 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 Center solicits and maintains files of vacancy listings, arranges employment interviews, and schedules on-campus recruiting by employers.

Don't wait until you are a senior — about to be thrust into the job market — before thinking about your career interests. Visit the Work-Learn and Career Planning and Placement Center early — you'll be way ahead later. Advisers are available on a drop-in basis or by appointment.

Educational Placement Service

Any student enrolled in the teaching credential program should establish a placement file with the Educational Placement Service. By using the information you provide about your background, training, and professional experience, advisers can match your qualifications with available positions. The University reserves the right to refer only those persons who are considered to be fully qualified. Advisers counsel candidates, communicate with employers, receive job listings, and arrange interviews. Students not pursuing a credential are encouraged to talk with an adviser to explore education as a potential career field or internship opportunity. Contact the Office in person or by telephone, 752-0724.

CAL AGGIE ALUMNI ASSOCIATION

Information:
The Alumni Center
University House
752-0286

In choosing the University of California, Davis as your University, you are making a life-long commitment . . . you will be identified with the Davis campus for the rest of your life. After graduation many people choose to continue their association with UCD through participation in the Cal Aggie Alumni Association.

The Association and its alumni members have aided the Davis campus through support and sponsorship of many activities and programs including the Alumni Scholarship Program, Alumni Day, Picnic Day, the Recreation Hall Campaign, legislative relations programs, and a student loan fund. In addition, the Association maintains a professional staff dedicated to meeting the needs of UCD's more than 50,000 alumni.

Each graduate of UC Davis is considered important as an alumnus and is given the opportunity to become a sustaining member of the Cal Aggie Alumni Association. For those who become sustaining members, the Association offers special programs and benefits.

*Nobody can guarantee you a career. But you can make one disastrous mistake right now — you can decide to spend your entire university time getting ready for just your first job. Can you afford to be that sure?
— Rhetoric professor*

Fees, Expenses
and Financial
Aid



Fees, Expenses and Financial Aid

FEES AND EXPENSES

It is extremely important to consider carefully 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) can be found in the following pages.

While the needs and resources of each student are different, the following information will give you an idea of the basic expenses students at UCD will incur. Legal residents of California are not required to pay tuition at the University. Students classified as nonresidents must pay tuition of \$800 per quarter. (See page 313 for the nonresident tuition fee statement.)

At the time of registration each quarter, every student must pay the following fees:

	Undergraduate students	Graduate students (excluding Law*)
University registration fee . . .	\$143.00	\$143.00
Memorial Union fee	3.50	3.50
Associated Students membership fee	10.00	
Graduate Student Assembly fee		3.00
Educational fee	100.00	120.00
Total for California residents	\$256.50	\$269.50
Tuition for nonresidents	800.00	800.00
Total for nonresidents	\$1,056.50	\$1,069.50

These fees are for the 1980-81 academic year and are subject to change without notice.

*Students in the School of Law should refer to the School announcement for explanation of fees.

Additional Fees and Expenses

Students may be subject to the following fees for optional services:

Parking (per year: \$24 to \$36 for cars, depending on the type of permit; \$12 for motorcycles)

Bicycles (annual fee for the required California State License, \$1.50)

Late payment registration fee (\$10)

Changes in class schedule after announced deadline (\$3)

Transcripts (\$2 for the first and \$1 for each additional copy requested at the same time)

Applications for readmission, Planned Educational Leave, or intercampus transfer (\$20; effective Fall Quarter 1981, \$25)

For details concerning fees and deposits, consult the publication *Student Fees and Deposits 1980-81*, available from the Registrar's Office. Current fees are also published in the *Class Schedule and Room Directory*.

(These fees are for the 1980-81 academic year and are subject to change without notice.)

Explanation of Fees and Expenses

University Registration Fee: \$143 per quarter; \$214.50 per semester for law students. Revenue from this fee is used to support a portion of the cost of student services programs including recreational services (MU and Rec Hall), counseling and advising services, career planning and placement services, student organization and activities services, learning skills center services, and health services. The health services portion of the fee can be treated as a medical expense deduction from income tax.

Educational Fee: \$100 per quarter for undergraduates; \$120 per quarter for graduate students; \$180 per semester for law students. Revenue from this fee is used to support a portion of the cost of the educational program. Undergraduate students enrolling for less than 9 units in any quarter may petition the Registrar's Office to pay the reduced Educational Fee of \$50.

Nonresident Tuition: \$800 per quarter; \$1,200 per semester for law students (see the nonresident tuition fee statement on page 313).

Memorial Union Fee: \$3.50 per quarter; \$5.25 per semester for law students. Paid by all full-time students.

Associated Students Membership Fee: \$10 per quarter. All full-time undergraduate students are members of the Associated Students, University of California, Davis (ASUCD). Graduate and professional students may become members by paying the fee (see also Graduate Student Assembly fee following).

Graduate Student Assembly Fee: \$3 per quarter. Paid by all graduate students but not mandatory for professional students in the schools of law, medicine, and veterinary medicine. Professional students may become members by paying the fee.

Law Student Association Fee: \$2.50 per semester.

Living Expenses

The Financial Aid Office estimates that the average 1980-81 expenses of a UCD undergraduate who is single will total \$4,700 including \$770 for fees, \$280 for books and supplies, \$1,098 for housing, \$1,485 for food, \$852 for personal expenses and \$215 for transportation. Estimated expenses for other single students are: graduate students, \$5,075; law, \$5,150; veterinary medicine, \$5,675; first-year medicine, \$5,550; second-through fourth-year medicine, \$6,250. For married students these categories range from an undergraduate low of \$7,050 to a high of \$9,500 for students in their last years of medical school.

These costs 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.

Transportation

Transportation is included in the cost of living estimates given above. See pages 10 and 37 for an idea of what types of transportation are available. Information on parking and bicycle regulations can be obtained through the Parking Operations Office located in the Police Department on campus (752-0659). Car pools are encouraged and the Car Pool Information Office (752-MILE) can help you find a ride or riders.

FEE REFUNDS

If you have to withdraw before the first day of instruction, you must fill out and return a "Cancellation of

Registration" form to the Registrar's Office, along with your validated Registration Card. After the first day of instruction, fill out a "Petition for Withdrawal" and follow the same procedures.

Refund Procedures

New Undergraduate Students:

Prior to Day 1, Registration Fees paid are refunded except for the \$50 Acceptance of Admission Fee, and other fees paid are refunded in full.

Day 1 and After, the \$50 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 Re-Admitted Students and New Graduate Students:

There is a service charge of \$10 for cancellation of registration or withdrawal 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 refers to calendar days beginning with the first day of instruction. Percentages listed (days 1-35) should be applied respectively to Tuition, Educational 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, Educational 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%

FINANCIAL AID

Information:
Financial Aid Office
1st floor, North Hall
752-2390

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

Financial need is the major criterion for most sources of aid other than scholarships. Eligibility is determined from a careful assessment of your financial situation which takes into account your family's income, assets, debts, number of children, and the estimated cost of attending the University. If you are eligible, you will be offered a combination of the funds from various sources.



Applications for loans, grants, and work-study employment are accepted throughout the academic year as long as funds are available. However, to be assured of priority consideration you should file your application for the 1981-82 academic year no later than *February 12, 1981*. Complete application instructions for prospective undergraduate students are contained in the *UC Undergraduate Admissions and Financial Aid Packet*. Continuing UCD students and prospective graduate students should obtain application forms and instructions from the Financial Aid Office in December 1980.

Undergraduates with outstanding academic records are encouraged to apply for scholarships. Scholarship applications for the 1981-82 academic year are available in October and must be filed by *January 15, 1981*. (See the Scholarship section beginning on page 41.)

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 the Graduate Division (see page 105).

For more information about awarding of financial aid, contact the Financial Aid Office.

TYPES OF FINANCIAL AID

Grants

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

Basic Educational Opportunity Grants (BEOG) are federally funded awards. All undergraduate financial aid applicants are required to apply for a BEOG each year by following the instructions on the financial aid application packet. Recipients must be enrolled for at least a half-time course load and must maintain good academic standing and make satisfactory academic progress.

- \$1,400 maximum per year
- Amount depends on financial need

Supplemental Educational Opportunity Grants are awarded to U.S. citizens or permanent U.S. residents who are at least half-time students in good academic standing and have exceptional financial need.

- \$200 to \$1,500 per year
- \$4,000 maximum for 4-year program
- \$5,000 maximum for 5-year program
- Grant cannot exceed 50 percent of total financial aid award

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 by following the instructions on 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 made to 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.

- \$300 to \$700 per year for Cal Grant A
- \$1,800 maximum per year for Cal Grant B
- Undergraduate California residents only

Educational Fee Grants provide qualified California residents with a grant to pay their Educational Fee for the first three quarters of attendance at a UC campus.

- \$300 maximum

University Grants including Educational Opportunity Grants are available to both graduate and undergraduate students.

- Maximum varies each year depending on funds available

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. Students must submit a regular Financial Aid Application and provide supportive documents by the filing deadlines before making an appointment with a Financial Aid counselor to complete the BIA application.

- Amount depends on need and availability of funds

Loans

A loan is an award which permits you to postpone paying part of the costs of your education until you have completed school. A financial aid offer almost always includes an offer of a long-term, low interest loan. Repayment of these loans begins after you graduate or withdraw from school.

Educational Fee Deferment Loans enable California residents to delay payment of all or some of the Educational Fee. Repayment may be deferred for Armed Forces, Peace Corps, and VISTA members.

- \$300 maximum per year
- 3 percent interest
- Repayment begins 9 months after graduation or withdrawal

University Student Loans of up to \$10,000 per student are available. If graduate studies are undertaken, payment may be deferred until completion or termination of studies. (Cosigner is required.)

- \$2,500 undergraduate maximum for first 2 years
- \$5,000 undergraduate maximum during 4 years





- \$10,000 maximum for graduate students, including loans taken out as undergraduates
- 3 percent interest
- Repayment begins 9 months after graduation or withdrawal

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

- \$2,500 maximum
- 7 percent interest
- Repayment begins 12 months after receipt of the degree or withdrawal

Health Education Assistance Loan (HEAL) Program provides federally insured loans to graduate students attending the Schools of Medicine and Veterinary Medicine. The loans are made by participating lenders, including banks, credit unions, and savings and loan associations.

- \$10,000 maximum per academic year
 - \$50,000 total maximum
 - Interest may not exceed 12 percent per year
- Repayment begins 9 months after completion of formal training, including accredited internship and residency programs, or withdrawal

Guaranteed Student Loans are available through banks and other lending institutions; financial need is no longer a criterion. Interest accrued while in school may be paid by the government if you qualify for federal interest benefits. Applications and information are available at the Financial Aid Office.

- \$2,500 maximum per year for undergraduate students, \$5,000 for graduate students
- 7 percent interest
- Repayment begins 9 months after graduation or withdrawal

Short-Term and Emergency Loans, provided by UCD alumni, ASUCD, and private donors, are designed to meet temporary, emergency financial needs of registered students. Apply at the University House Annex any time during the academic year.

- \$200 maximum
- Interest-free if repaid on time

National Direct Student Loans are for U.S. citizens or permanent U.S. residents. Students may be limited to a percentage of their need because of heavy demands and limited funds. Repayment starts nine months after graduation or withdrawal from school, and may be extended over 10 years. Deferment is possible for Armed Forces, Peace Corps, and VISTA members and students who transfer to other schools. A portion of the loan may be cancelled for certain veterans. Some

teachers of students from low-income families, and full-time teachers of handicapped children, may also qualify for partial loan cancellation.

- \$2,500 undergraduate maximum for first 2 years
- \$5,000 undergraduate maximum during 4 years
- \$10,000 maximum for graduate students, including loans taken out as undergraduates
- 3 percent interest

Work-Study Employment

The **Work-Study Program** refers eligible financial aid recipients to employment with the University and non-profit organizations. Opportunities range from entry-level jobs to jobs requiring a high degree of technical skill. College work-study employment is coordinated by the Student Employment Center. (For information about this service and other student employment opportunities, see page 34.)

- 19 hours maximum per week during school, full time during vacation

SCHOLARSHIPS AND AWARDS

Information:
Scholarship Office
University House Annex
752-2397

At UC Davis a special effort is made to recognize exceptional students. Approximately 150 different undergraduate scholarships are administered by the Scholarship Office, and many more scholarships are handled through outside agencies.

Scholarships are awarded on the basis of academic excellence and exceptional promise. 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 is based on letters of recommendation and a personal essay in which your University goals and objectives are stated. *Some awards may be 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.

Applications for scholarships are available at the start of each Fall Quarter for the following academic year. Deadline for submission of application materials is *January 15*. Announcement of winners is usually made beginning in mid-April. The Scholarship Office publication, *New Horizons*, provides more detailed information on specific scholarships.

Graduate students are also eligible for various scholarships and fellowships. (See also page 105)

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 \$100 one-time award) or may be accompanied by a stipend generally covering the difference between family resources and yearly educational costs (see page 38). The Regents Scholarship Administrative Committee conducts personal interviews during the final selection process. These scholarships are renewable as long as you maintain a 3.0 grade-point average.

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

Alumni Scholarships, provided by the Cal Aggie 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.

- \$500 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, 752-0543.

- Full fees, books and supplies
- \$1,000 per year for miscellaneous expenses
- 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 \$200 to \$500

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



Admission

Information:
Undergraduate Admissions Office
175 Mrak Hall
(916) 752-2971
(916) 752-6TTY (Telecommunication device for the speech and hearing impaired)

APPLYING TO UC DAVIS

With careful reading you should find most of the answers to your admissions questions in the following sections. The key to preparing a successful application is supplying us with accurate, complete, and timely information.

The first step in applying for admission is to select a major or area of interest within a college that best suits your academic goals. To assist you in this choice you will find an overview of undergraduate studies listed within each College section. (See also Undergraduate Studies entry on page 45 and "How to Use this Catalog," page 4.) The second step is to determine the admission category to which you belong. (Admission categories are defined on page 44.) This is a very important step because entrance requirements and filing dates may vary depending on your category of admission. The third step is to obtain and complete the Undergraduate Admissions Packet and return it during the appropriate filing period. (On the application form there is a question that allows you to request information on financial aid and housing. Once your admissions application has been submitted you should keep in contact with the Financial Aid and Housing Offices since admission to the University does not guarantee the awarding of financial aid or housing.) The final step is to arrange to have all supporting documents (official test scores and transcripts) forwarded to the Undergraduate Admissions Office as early as possible.

Application and admission procedures are outlined beginning on this page. A summary of the steps in the application procedure appears on page 51. Use this checklist to follow your application through the admissions process.

The Services to Handicapped Students Office encourages applicants with a physical impairment to contact that office (see page 33) for further information concerning admission or assistance if needed.

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 ahead and make an appointment with the Undergraduate Admissions Office. For scheduled or individual tours of the campus, contact the Visitors Services and Ceremonies Office (129 Mrak Hall, 752-0539). If you would like to visit classes, the Visitors Services and Ceremonies Office can make the appropriate arrangements.

APPLICATION PROCEDURES

Undergraduate application packets may be obtained from any California high school, community college, or University of California Admissions Office. Completed application materials and communications concerning admission to UC Davis should be sent to the Undergraduate Admissions Office, 175 Mrak Hall, University of California, Davis 95616.

A nonrefundable application fee of \$25 (effective Fall Quarter 1981; \$20 for prior quarters) must accompany your application. Please make your check payable to The Regents of the University of California. If you have applied previously and were ineligible, or if you were admitted previously and did not register, you are required to file a new application for the quarter for which you seek admission and submit a new application fee.

Opening filing dates are the same for all UC campuses and are listed below. All applications filed during the first month of the filing period will be accepted for consideration. In addition, this campus will continue to accept applications for most majors until approximately two months prior to the start of a quarter. However, after the first month, some departments, colleges, or campuses may close to new applicants as enrollment quotas are filled. Once a department, college, or campus has closed, any additional applications which are

received will be forwarded to the next open campus preferred by the applicant. Therefore, it is important to give careful consideration to alternative campus preferences when completing the application.

Opening dates of the initial filing periods for new applicants are as follows:

Quarter to be Admitted	Opening Date of Filing Period
Spring 1981	October 1, 1980
Fall 1981	November 1, 1980
Winter 1982	July 1, 1981
Spring 1982	October 1, 1981

Delays in notification can be avoided if you complete the application accurately, include your essay and filing fee, and arrange for transcripts (including course work in progress) and official test scores to be sent to the Undergraduate Admissions Office as soon as they are available. Because advanced standing eligibility depends upon the final outcome of quarter or semester course work in progress, this office must receive a final transcript of all work completed before you may register.

Duplicate Applications

Students should file an application with one campus only, listing alternate campus preferences in the space provided on the application. If you file simultaneously for admission to more than one campus, admissions processing will be suspended until you notify the Student Academic Services (570 University Hall, University of California, Berkeley 94720) which campus is your first choice. Fees submitted with duplicate applications cannot be refunded.

Transcripts and Test Scores

Transcripts and other documents submitted during the application process become the property of the University and cannot be returned or forwarded to another institution. Please note that it is your responsibility to arrange for transcripts and to insure that they arrive promptly.

If you are in high school when you apply, please request that your high school send an official transcript of all work completed through your junior year directly to the Undergraduate Admissions Office. This preliminary transcript should also include a list of work in progress (senior-year courses in which you are currently enrolled or plan to complete before graduation). In addition, you must also submit a final transcript including a statement of graduation or a Certificate of Proficiency (see page 50). Freshman applicants (see "Explanation of Application Categories") are also required to submit results of their SAT or ACT tests and three achievement tests. (See page 47.)

If you have attended or are attending another college when you apply, you must have final transcripts of all college-level work, as well as your high school transcript, sent directly to the Undergraduate Admissions Office.

Change of Campus

If, after you have applied to the Davis campus, your plans change and you prefer to be considered for admission on another UC campus, you are required to write Student Academic Services (570 University Hall, University of California, Berkeley 94720) stating your new preference and the reason for your change. Your records will be transferred to the campus of your choice, provided that campus still has openings for admission at the time of your letter. Processing a change of campus preference takes several weeks; however, your admissions priority will be assigned based on the date your request for a change was made.

Notification

After returning your application materials you may be wondering,

- Has the University received my application forms?
- will I be considered for admission at my preferred campus?
- will I be admitted to the University?

Our notification procedures answer these questions in order. First, you will be mailed a notice acknowledging receipt of your application; later, you will receive a letter confirming your admission status.

As to your chances of being admitted, during the last academic year well over 90 percent of the eligible applicants who applied on time to UC Davis were admitted.

The length of time before admission notification varies, depending upon the completeness of your application. For example, most applicants for Fall Quarter will receive final notification by early spring, provided records have been received promptly.

Acceptance of Admission

When you receive your notification of admission status you will receive an important form with it, if you are admitted. Filing this form, called the "Statement of Intent to Register," is a necessary step to complete the admissions process. Please complete this form and return it with the required nonrefundable \$50 deposit. This 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 readmit applicants (see Explanation of Application Categories below) are not required to submit the \$50 deposit.

EXPLANATION OF APPLICATION CATEGORIES

An **undergraduate** applicant is a student who wishes to complete a program of studies leading to a Bachelor of Arts (A.B.) or Bachelor of Science (B.S.) degree.

A **freshman** applicant (page 45) is a student who has graduated from high school or who has earned a "Certificate of Proficiency," but has not enrolled since high



Make your own decision on what kind of education you want. Don't feel you have to do what everyone else is doing.
— Senior, Mathematics

school attendance in a regular session of any collegiate-level institution (with the exception of summer session attendance immediately following high school graduation).

An **advanced standing (transfer)** applicant (page 48) is a student who has been registered in a regular or extension session of a college or university other than the University of California since high school graduation.

An **intercampus transfer** applicant (page 49) is an undergraduate student who is currently, or was previously, registered in a regular session at another campus of the University of California and has not since been registered in another collegiate institution.

An **Educational Opportunity Program** applicant (page 48) is a low-income/minority student who may or may not meet the standard admission requirements for freshman or advanced standing status.

A **readmit** applicant (applicant for readmission) (page 54) is a student who was formerly registered on the Davis campus, who has interrupted the completion of consecutive quarters of enrollment and who is not currently participating in the Planned Educational Leave Program. (See page 49 for re-entry for the non-traditional student.)

A **reentry** applicant is an undergraduate student age 25 or over or a graduate student age 30 or over (see page 49).

A **limited status** applicant (page 49) is a collegé graduate (or near-graduate) who is not a candidate for an advanced degree, but who has the limited objective of enrolling in certain courses on the Davis campus.

A **special status** applicant (page 49) is any person 21 years of age or older who is prepared, by reason of special attainment or background, to undertake limited course work toward a specific objective.

A **second baccalaureate** applicant (page 49) is a college graduate who seeks an additional bachelor's degree. Approval is granted only to students who have completely changed their educational objectives.

An **international** applicant (page 49) is a student who is not a U.S. citizen, immigrant, or refugee.

A **concurrent enrollment** applicant (page 50) is a community member who wishes to fulfill an academic interest or to test academic ability by enrolling in a limited number of regular University courses on a space-available basis. This program is offered through University Extension and does not require the applicant to meet regular admission requirements.

A **part-time status** applicant is a person who wishes to complete the bachelor's degree at UC Davis on a part-time enrollment basis. See Page 54 for details.

A **graduate** applicant is a college graduate who wishes to complete a program of studies leading to an advanced degree, i.e., the master's or doctorate. See the section beginning on page 99 for details.

A **professional school** applicant is a student who has completed the requirements necessary for admission to one of the professional schools on the Davis campus (Administration, Law, Medicine, Veterinary Medicine). Please see the appropriate sections in this catalog for specific information.

UNDERGRADUATE STUDIES

Undergraduate studies at the University of California, Davis, are divided into three colleges: Letters and Science, Agricultural and Environmental Sciences, and Engineering. When you apply for admission to Davis, you make an application to one of these Colleges. The three Colleges differ in their educational focuses and in the major programs they offer.

The **College of Agricultural and Environmental Sciences** focuses on six areas of concentration: animal sciences; plant sciences and pest and disease management; food, nutrition, and consumer sciences; applied economic and behavioral sciences; resource sciences and agricultural engineering; and biological sciences (majors are listed on pages 68-69). The **College of Engineering** focuses its curricula on the engineering sciences (majors are listed on page 75.) The **College of Letters and Science** curricula encompass the humanities, including the arts, and the social, physical, and biological sciences. They enable the student to pursue fundamental knowledge and to learn those basic intellectual disciplines which lead to a liberal education (majors are noted on page 91).

ENTRANCE REQUIREMENTS

The University's undergraduate admission requirements are based on two principles:

- The best predictor of success in the University is high scholarship in previous academic work, and
- The study of certain subjects in high school gives you a good preparation for University work and reasonable freedom in choosing a specialized area of study.

Undergraduate entrance requirements are based upon these general principles but may vary in specific details, depending upon the type of admission you are seeking. If you are planning to apply as an advanced standing student it is important to remember that your high school record will form part of the basis for our evaluation of your qualifications and therefore an official copy of it must be submitted. Listed below are the requirements for all undergraduate admission categories.

ADMISSION AS A FRESHMAN

To be eligible for admission to the University of California as a freshman, you must meet specific **Subject, Scholarship, and Examination Requirements**. If you have any questions or need assistance in determining your eligibility, please contact your school counselor,

the Office of Relations with Schools, or Undergraduate Admissions on the nearest UC campus. Final determination of UC eligibility is made by the campus Admissions Office.

Subject Requirement

You must complete certain high school courses in the subject areas listed below with a B average and earn a grade of at least C in each semester of each course. (If your school gives only year-end grades, you must complete each year course with a grade of C or better.) 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, but 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 a more advanced course) with a grade of C or better.

(Note: A year course in high school constitutes one unit.)

- A. History** — 1 year
One year of United States history, or one-half year of United States history and one-half year of civics or American government.
- B. English** — 3 years (4 years beginning Fall 1981)
Three years of English — composition and literature (university preparatory in nature). Not more than one year will be accepted from the ninth grade. (See "English proficiency" below.)
- C. Mathematics** — 2 years
Two years of mathematics — elementary algebra, geometry, intermediate and advanced algebra, trigonometry, calculus, elementary functions, matrix algebra, probability, statistics, or courses combining these subjects. Nonacademic courses such as arithmetic and business mathematics may not be used.
- D. Laboratory Science** — 1 year
A year course in one laboratory science, taken in the tenth, eleventh, or twelfth grade.
- E. Foreign Language** — 2 years
Two years of one foreign language. Any foreign language with a written literature may be used.
- F. Advanced Course** — 1 or 2 years
This requirement must be satisfied by one of the following:
 - **Mathematics:** One year of advanced mathematics — intermediate algebra, trigonometry, or other comparable mathematics courses.
 - **Foreign language:** Either an additional year in the same language used for "E" above or two years of a second foreign language.
 - **Science:** A year course in any laboratory science completed subsequent to the laboratory science used for "D" above.

The required courses listed above constitute only 10 or 11 of the total (15) units required for admission to the University. The remaining units provide an opportunity for you to strengthen your preparation for University work. Additional courses in mathematics, especially second-year algebra and trigonometry, are essential for many major programs. A fourth year of English, including composition skills, is also highly recommended for all students, and will be required of applicants beginning Fall Quarter 1981.

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 are acceptable in fulfillment of the Subject Requirement.

English Proficiency

Instead of a fourth year of high school English, you may satisfy the **English Proficiency Requirement** by achieving above a specified level in one of the following examinations:

- University Proficiency Examination in English Composition (level 4);
- College Board Achievement Test in English Composition (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, 3).

Scholarship Requirement

You must earn a B average in the "A to F" courses required for admission with no grade less than a C. The overall grade-point average required for those subjects taken after the ninth year is dependent upon your score on the ACT or SAT test (see the eligibility index). If you are a nonresident applicant, your grade-point average in the required subjects must be 3.4 or higher.

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 up to a total of two semester courses in which you received a grade of D or lower. The grades you earn in repeated courses, however, will not be counted higher than a C in determining your scholarship average. If the courses you repeat were taken

before the ninth grade, they will be treated as if you were taking them for the first time; if courses you repeat were taken in the ninth grade, the grade will not be used in computing your grade-point average, but the courses may be used to satisfy subject requirements.

Examination Requirement

All freshman applicants must submit scores from the College Entrance Examination Board (CEEB) or the American College Testing (ACT) Program. If you are applying for admission to the Fall Quarter, you should take the tests no later than January of your senior year (earlier testing is recommended for prospective engineering students). The following tests are required:

- Scholastic Aptitude Test (CEEB) — The verbal and mathematics tests scores you submit must be from the same sitting

or

- American College Test

and

- Three Achievement Tests (CEEB), which must include (a) English Composition, (b) one from among the social studies or one from among the foreign languages, and (c) mathematics (level I or II)

If you are a California resident and your grade-point average in the required high school subjects is over 3.3, the tests are required but your scores will not be used to determine your eligibility.

The accompanying table is an eligibility index. If your grade-point average in the "A to F" requirement is less than 3.3 you should refer to this table to see what examination scores you must earn to be eligible for University admission.

Admission by Examination Alone

If you do not meet the scholarship and subject requirements for admission and have completed fewer than 12 quarter or semester units since high school graduation, you can qualify for admission as a freshman by examination alone. (If you have completed transferable college courses, CEEB tests cannot be taken in academic subjects covered in those courses.) You must take the same CEEB tests discussed above and receive a total score of at least 1100 on the Scholastic Aptitude Test. Your total score on the three Achievement Tests must be 1650 or higher with no score less than 500 on an individual Achievement Test. If you are a nonresident applicant, your score on the three Achievement Tests must be 1730 or higher. (At present, ACT scores may not be substituted for SAT scores to qualify for admission by examination alone.) High school graduation or a Certificate of Proficiency is also required for students who qualify for admission by examination alone.

Examination Arrangements: Make arrangements to take the required Scholastic Aptitude Test (SAT) and the Achievement Tests by writing to the Educational Testing Service, P.O. Box 1025, Berkeley, California

Eligibility Index

Grade-Point Averages A-F Requirement	ACT* Composite Scores	SAT† Total Scores
2.78	35	1600
2.79	35	1580
2.80	34	1550
2.81	34	1530
2.82	33	1510
2.83	33	1480
2.84	33	1460
2.85	32	1440
2.86	32	1410
2.87	32	1390
2.88	31	1370
2.89	31	1340
2.90	30	1320
2.91	30	1300
2.92	29	1270
2.93	29	1250
2.94	28	1230
2.95	28	1200
2.96	27	1180
2.97	27	1160
2.98	26	1130
2.99	26	1110
3.00	25	1090
3.01	25	1060
3.02	24	1040
3.03	24	1020
3.04	23	990
3.05	22	970
3.06	21	950
3.07	21	920
3.08	20	900
3.09	19	880
3.10	18	850
3.11	18	830
3.12	17	810
3.13	16	780
3.14	15	760
3.15	14	740
3.16	14	710
3.17	13	690
3.18	12	670
3.19	11	640
3.20	10	620
3.21	9	600
3.22	9	570
3.23	8	550
3.24	8	530
3.25	7	500
3.26	7	480
3.27	6	460
3.28	6	430
3.29	5	410
3.30	5	400

94701, or P.O. Box 592, Princeton, New Jersey 08540. For the American College Test (ACT) write to American College Testing Program, Registration Unit, P.O. Box 168, Iowa City, Iowa 52240. (Test fees should be paid to

*The American College Test (ACT) is scored in intervals of 1 point from a minimum of 1 to 35 maximum.

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



the Testing Service, not the University.) Your test scores will be regarded as official only if they are reported directly to the Undergraduate Admissions Office by a Testing Service. Your final notification of admission cannot be released until your scores from all tests have been received by the Undergraduate Admissions Office. (UC Davis's CEEB code is 4834 and the ACT code is 0454.)

ADMISSION TO ADVANCED STANDING

An advanced standing transfer applicant is a student who has been registered in a regular or extension session of a college or university other than the University of California since high school graduation. An advanced standing student may not disregard his or her previous college record and apply for admission as a freshman.

Admission Requirements

If you are an advanced standing applicant, the requirements for admission will vary according to your high school record. No examinations are required for admission purposes if you have completed more than 12 quarter or semester units of transferable college credit. If you have completed fewer than 12 units since high school graduation, the examination requirements for freshman applicants also apply. If you are a nonresident, you need to meet the additional requirements described at the end of this section.

The transcript you submit from the last college you attended must show, as a minimum, that you were in good standing and that you had earned a grade-point average of 2.0 or better. If your grade-point average fell below 2.0 at any one college you attended, you may have to meet additional requirements in order to qualify for admission.

As an advanced standing applicant you must also meet one of the following conditions:

- If you have met the Eligibility Index or your high school scholarship average in those required subjects was 3.0 or better, you may be admitted in advanced standing any time after you have established an overall grade-point average of 2.0 or better in another college or university. You must also satisfy the examination requirement for freshmen if you have completed fewer than 12 quarter or semester units of transferable college credit since high school graduation.
- If you met the Eligibility Index or your high school scholarship average in the required subjects was 3.0 or better but you have not completed one or more of the required high school subjects, you may be admitted after you have:
 1. Established an overall grade-point average of 2.0 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 lacked, and

3. Completed 12 or more quarter or semester units of transferable college credit or have met the examination requirements for freshman applicants.

- If you were ineligible at the time of high school graduation because of low scholarship or a combination of low scholarship and a lack of required subjects, you may be admitted after you have:

1. Established an overall grade-point average of 2.4 or better in another college or university,* and
2. Completed 84 transferable quarter (or 56 semester) units, and
3. Completed appropriate college courses with a grade of C or better in the "A to F" subjects not completed in high school. (Up to two units of "A to F" credit may be waived if (1) and (2) above are satisfied.)

or

4. Completed (1) and (2) above and one college course in mathematics, one in English, one in either U.S. history, a laboratory science, or foreign language. The courses must be passed with a grade of C or better, and, with the exception of mathematics, must be transferable to the University. The course in mathematics means completing a sequence of courses at least as advanced as the equivalent of two years of high school algebra (elementary and intermediate) or one year of algebra (elementary) and one year of high school geometry.

Nonresident Applicants

A nonresident applicant for advanced standing who meets the admission requirements for freshman admission must have a grade-point average of 2.8 or higher in college courses that are accepted by the University for transfer credit.

If you lack any of the required high school subjects, and are a nonresident, you must complete college courses in those subjects with a grade of C or higher. If you graduated from high school with less than a 3.4 grade-point average in the subjects required for freshman admission you must have completed at least 84 quarter units (56 semester units) of transferable work with a grade-point average of 2.8 or higher. Upon successful completion of that work, you may have the requirement for two units of the required high school subjects waived.

*This is a return to the original transfer requirements in effect before the experimental 2.0 admission requirement was instituted in Fall Quarter 1973. The experimental requirement allowed students to transfer to the University with the minimum grade-point average of 2.0 with 84 transferable quarter (or 56 semester) units without regard to high school records. The experiment has been evaluated by the Board of Admissions and Relations with Schools and it is their recommendation that it be discontinued and that the University return to the required 2.4, effective Fall Quarter 1978.

SPECIAL PROGRAMS AND ADMISSIONS CATEGORIES

Educational Opportunity Program (EOP)

The Educational Opportunity Program is designed to assist and provide opportunities in higher education for minority and economically disadvantaged students with academic potential who, historically, have been underrepresented at the University of California.

As an EOP applicant you may be admitted in one of two ways: as a freshman or advanced standing student who has met the standard entrance requirements, or as a special-action freshman or advanced standing student who has not met the entrance requirements but who has demonstrated academic potential.

You may obtain an application for admission to the Educational Opportunity Program at UC Davis by writing to the Undergraduate Admissions Office, 175 Mrak Hall, University of California, Davis, CA 95616. The \$25 application fee is waived for qualified EOP applicants. (If you do not qualify for the EOP, you must submit the nonrefundable \$25 fee.) The EOP also provides special assistance in all areas of academic and student life (see page 30).

Academic Reentry Program

The Academic Reentry Program gives assistance in applying to the University to students in nontraditional age categories and reentering the University after life and work experience. Preadmission and reentry advising provides assistance in combining past study with current academic and career goals. A reentry student who has not met the entrance requirements but has demonstrated recent academic potential, has special talents, or a disadvantaged educational history may be considered for admission by special action. (See page 31 for more information.)

Second Baccalaureate Status

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.

Admission to the College of Agricultural and Environmental Sciences and the College of Letters and Science 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.*)

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. 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 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 and the College of Letters and Science requires the approval of the Admissions Officer and the dean of the college. You must also submit transcripts from all schools attended, including a final high school transcript. 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)

Special Status

The special status classification is designed 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 the approval of 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.)

Intercampus Transfer Status

If you are currently registered as an undergraduate student or have been registered on another campus of the University of California, and have not subsequently registered at another institution, you may apply for an intercampus transfer to UC Davis. Intercampus transfer applications are available from and must be returned to the Registrar's Office on the UC campus you last attended. A nonrefundable filing fee of \$25 (effective Fall Quarter 1981; \$20 for prior quarters) must be submitted with your transfer application. Filing dates are the same as those listed for freshman applicants.

International Student Status

Applicants from other countries will be admitted in accordance with the general procedures governing nonresident admission. You may request an application by writing the Undergraduate Admissions Office, 175 Mrak Hall, University of California, Davis, California 95616. If you are not a United States citizen, immigrant, or refugee, you must return this application with a finan-



cial information form and the nonrefundable application fee of \$25 (effective Fall Quarter 1981; \$20 for prior quarters). It is very important to file your application during the appropriate filing period for the quarter for which you wish to attend (see page 44). Applications received after the first month of the filing period will be processed as space permits.

If your schooling has not been in English, or if English is not your native tongue, you are required to submit the results of the Test of English as a Foreign Language (TOEFL). Write to the Educational Testing Service, P.O. Box 899, Princeton, New Jersey 08540, to arrange a testing date and location in your home country. The minimum TOEFL score which will be accepted is 500.

Prior to registration, international students whose native language is other than English are required to demonstrate that their command of English is sufficient to profit by instruction at the University. A proficiency examination is given at UC Davis during the week before school begins. If you do not pass this examination, you must enroll in English 25 or 26 until you have acquired the necessary language skills.

As part of the application process, you are also required to submit your secondary school and college records (English translations must accompany all records). These records should include all certificates and transcripts of grades awarded in each subject. You will receive credit for University studies outside the United States if the course work was completed in an approved university and is considered to be academically equivalent to course work offered at the University of California. The Undergraduate Admissions Office will have the final authority for assessing the transferability of credit.

Financial aid information can be obtained from the Financial Aid Office (see page 38). There are no grants, loans, or scholarships awarded by the University of California, Davis campus to undergraduate international students during their first year of study, and at no time after the first year is financial assistance assured. Therefore, you must demonstrate adequate financial resources for your term of enrollment.

For additional information, see page 32.

Concurrent Enrollment Status

Concurrent courses are regular University courses open to the community on a space-available basis. The purpose of the program is to allow an individual to pursue academic interests and to test academic abilities at the University.

For information, write the University Extension Office, 4485 Chemistry, University of California, Davis 95616.

For admission to the Graduate Division, see page 102.

For admission to the Graduate School of Administration, see page 113.

For admission to the School of Law, see page 115.

For admission to the School of Medicine, see page 119.

For admission to the School of Veterinary Medicine, see page 123.



ADDITIONAL INFORMATION

High School Proficiency Examination

The University of California will accept the Certificate of Proficiency awarded by the State Department of Education upon successful completion of the California High School Proficiency Examination in lieu of the regular high school diploma. However, you must also meet all other University entrance requirements (subject, scholarship, examination). On University records, the date of graduation will be the date of the certificate. Admission by CEEB scores alone is still an option if you were ineligible on the basis of your high school record.

Subject A Requirement

The University requires every undergraduate student to demonstrate college-level proficiency in English com-

position. This requirement is known as "Subject A." See page 60 for a full description of the means by which this requirement may be satisfied.

Advanced Placement Examinations

The Advanced Placement Examinations of the College Entrance Examination Board are taken in conjunction with courses taken in high school. You can receive 10 quarter units of University credit for each examination (except mathematics) in which you earn a score of 5, 4, or 3. These credits will apply toward the total required for graduation from the University. See the table on page 58 for course work equivalencies and limitations of credit.

CLEP

The University awards credit for certain examinations of the College-Level Examination Program of the College Entrance Examination Board. For general examinations in Social Science/History, Natural Science, and Humanities, ten quarter units of credit are given for scores of 500 (50th percentile) or better. Credit is also given for subject examinations which cover work appropriate to a University course. You must pass those examinations with a score of 50 (50th percentile) or better. The University will grant five quarter units for examinations which cover one semester of work and ten quarter units for examinations which cover two semesters of work. CLEP credit is not given for examinations that duplicate courses you have taken.

Credit from Another College

The University gives unit credit to transfer students for courses they have taken at other accredited colleges and universities, including some extension courses. To be accepted for credit, the courses must be consistent with those at the University as determined by the Admissions Office.

California community colleges offer a full program of courses approved for transfer credit. You may earn 105 quarter units (70 semester units) toward a University degree at a community college. Subject credit for transferable courses in excess of these units may also be granted to meet University graduation requirements.

Applicants to the College of Agricultural and Environmental Sciences and to the College of Letters and Science who have more than 120 quarter units of credit for transfer must have the approval of the Dean of the College and satisfy University requirements for admission. (College of Engineering applicants should refer to page 76.)

REDIRECTION

If at the end of the first month of the application filing period (see page 44) there are more qualified applicants than a UC Davis college can accommodate within its enrollment quotas, all applications will be reviewed and some applicants may be redirected to another campus.

ADMISSIONS 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, listing the college and major you prefer. Include your essay and a check or money order for \$25 (\$20 prior to Fall Quarter 1981) with your application forms and return them to the Undergraduate Admissions Office *during the first month of the filing period for the quarter in which you wish to enter.*
- 3. Request that transcripts, including work in progress, be sent from those schools attended. If test scores are required, please arrange to have these forwarded by the testing agency.
- 4. Retain for your records the notice received from the Undergraduate Admissions Office acknowledging receipt of your application.
- 5. Respond to Undergraduate Admissions Office requests for additional information, such as transcripts, test scores, or confirmation of work in progress. **Note: Your eligibility for admission cannot be evaluated until all your application materials are received,** i.e., application form, essay, transcript, work in progress, and test scores (if required), so it is important to make these arrangements if you want to avoid delay in the processing of your application.
- 6. Retain for your records the notification of admission received with your "Statement of Intention to Register" form.
- 7. Return your "Statement of Intention to Register," with the nonrefundable advance deposit of \$50 (if required), as soon as possible so your registration materials can be ordered before the day you register.



Academic Information

WHEN YOU ARRIVE

Information:
Summer Advising/Orientation Programs
Advising Services
South Hall
752-3000

Starting off on the right foot at UCD is made a little easier by various programs designed to introduce you to the University.

The Summer Advising and Registration Conference is a chance for entering students, both freshmen and transfers, to visit the campus for two or three days during the summer. If you are a freshman, your parents are also invited to attend, and a special parents' program is planned for them. During the conference you will have a chance to become familiar with the campus, learn about the services available to students such as financial aid and student advising, take required placement exams and complete your registration and enrollment in classes. You will also be able to meet students, professors, and staff members and get some advice about majors, requirements, social life, and answers to questions you or your parents may have. It's a good way to start out, and Davis won't seem like such a strange new place in the fall.

Orientation Week, held at the beginning of each Fall Quarter, offers new and continuing students a variety of activities, special events, and meetings to get the new quarter started. Some of the things that are happening include departmental open houses, tours of the campus, concerts and lectures, registration, and meetings with deans and advisers. Orientation activities are also held for students entering in Winter and Spring Quarters.

REGISTRATION PROCEDURES

Information:
Registrar's Office
124 Mrak Hall
752-2973

Registration is the means by which you become a student at the University. The registration process includes completion and filing of informational forms, payment of fees, and enrollment in classes. Every UCD student must register *each* quarter.

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

- Submit a Statement of Residence (see page 313).
- Return the completed Medical History form, 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.

Your registration will be complete when you have presented your completed registration forms to the Registrar's Office by the announced deadline and have received your validated Registration Card. Late registration privileges extend through the tenth day of instruction, but you will be assessed a fee of \$10 to defray the extra clerical costs of late registration. Registration after the tenth day of instruction, when approved, bears a late fee of \$25.

Undergraduate students must carry a study load of at least 12 units each quarter in order to be certified as full-time students for social security, insurance, and financial aid purposes, or to compete in intercollegiate athletics. Graduate students must carry a study load of

*Meeting a faculty adviser at the Summer Advising and Registration Conference was very helpful; if something goes wrong in the fall, I know there's someone to see who already knows me.
— Freshman, Undeclared*

at least 4 units each quarter in order to be certified as full-time students.

If you have not satisfied the Subject A requirement, you must enroll in the English A course (see page 196). Consult the current *Class Schedule and Room Directory* (published about seven weeks before the beginning of the quarter and available in the campus bookstore) for more detailed information.

It is the responsibility of each student to be familiar with announcements and regulations printed in official publications.

\$50 Reduced Fee Program

If you are a full-time undergraduate student enrolled for less than nine units in any quarter (including non-credit courses, e.g., Mathematics B) you may petition for a \$50 reduction in the Educational Fee. This reduction is for one quarter and a student is expected to maintain minimum progress. Petitions are available at the Registrar's Office and must be filed with that Office no later than the tenth day of instruction.

Part-Time Degree Program

You may be able to pursue a bachelor's or master's degree at UC Davis on a part-time basis if you qualify for the Program for Part-Time Degree Students. If you are employed, retired, or have family responsibilities which preclude full-time study, you may be able to study on this basis. Part-time students may change status between full-time and part-time as their circumstances change. To be considered a part-time student, an undergraduate must be enrolled for less than nine units per quarter. Minimum progress requirements are waived for graduate and undergraduate part-time students (see page 59). Petitions are available at the Registrar's Office and must be filed with that Office no later than the tenth day of instruction.

Employee Reduced Fee Program

Full-time University employees who are qualified for admission may work toward a degree through the Employee Reduced Fee Program. Employee-students pay $\frac{1}{3}$ of the regular fees and enroll each quarter for up to six units, or for one course regardless of the number of units. Detailed information is in the *UC Davis Staff Personnel Policy Manual* (Section 380-42) available in Department Offices, at the Library Reference Center or the Employee Development Unit of the Personnel Office, 752-1772. Petitions are available at the Employee Development Unit.

Adding or Dropping Courses

You must file a Drop-Add Petition in order to add or drop courses after your initial enrollment in classes. You should file the petition with the office of the department offering the course. See the *Class Schedule and Room Directory* for more information and filing dates.

Changes of Major, College, or School

With the approval of the appropriate dean or deans, a student in good standing can transfer from one area of

study to another. Petitions for this purpose may be obtained from the Registrar (Letters and Science major change petitions are obtained from department offices).

Petitions for a change of College must be filed in the first five weeks of the quarter. See under various college or school sections in this catalog for eligibility and major change requirements.

Change of Name

Petitions for this purpose may be obtained from the Registrar. (Students planning to graduate should file this petition during the first five weeks of the quarter in which they graduate.)

Withdrawals

Withdrawals may be granted by the University for emergency reasons or for good cause. Unauthorized withdrawals may jeopardize your registration privileges and result in failing grades. Request the forms for withdrawal and file them at the Registrar's Office. See page 38 for information on fee refunds. (See below for a planned temporary leave.)

If you have been 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 have been receiving veterans benefits you must also report to the Veterans Affairs Office.

Reentry after an Absence

If you are a former UCD student planning to return to the University of California on the Davis campus, you must file an Application for Reentry with the Registrar along with the nontransferable, nonrefundable fee of \$20 (\$25 effective Fall Quarter 1981). (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.

Quarter	Deadline Date
Fall 1980	August 29, 1980
Winter 1981	December 12, 1980
Spring 1981	March 13, 1981
Fall 1981	August 28, 1981

Planned Educational Leave Program (PELP)

A Planned Educational Leave is defined as a planned interruption or pause in your regular, full-time education during which you temporarily cease formal studies at Davis while pursuing other activities that may assist in clarifying your educational goals. The intent of the program is to make it possible for a student 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.



I went back to school after taking two years off and working. By then I knew what I really wanted to learn — as well as what I wanted to do with what I learned.
— Junior, Environmental Planning and Management

Each applicant for enrollment in PELP is required to file an application form, including a brief explanation of the reasons for leaving the campus, and must state in writing when he or she intends to resume academic work. Applications for Planned Educational Leave should be filed with the Registrar's Office (Admissions Office for new students) no later than the tenth day of instruction.

A fee of \$20 (\$25 effective Fall Quarter 1981) 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 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 second week of instruction in a quarter.

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

At the end of the leave, you are guaranteed readmission as long as you resume regular academic work at the agreed-upon date. Students who do not return at the prearranged time and do not extend their leave will be considered to have withdrawn.

You will not be eligible to receive 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 insure the availability of financial aid upon your return.

Applications and specific information about the Planned Educational Leave Program are available from the Counseling Center in North Hall. For those students who have been admitted but have not attended classes, applications and information are available from the Office of Admissions, Mrak Hall.

SCHOLASTIC REQUIREMENTS

The academic year consists of three ten-week quarters. Two six-week summer sessions are also offered. Students normally attend the University three quarters per school year, but you may accelerate your progress by enrolling in one or both summer sessions (see page 18).

Credit for academic work in the University is evaluated in quarter units. One quarter unit represents three hours of work per week by the student, including both class attendance and preparation. Laboratory and discussion sections may or may not be given unit value. (To convert quarter units to semester units, multiply by 2/3; from semester to quarter units, multiply by 3/2.)

GRADING

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)*
- I, *incomplete (work is satisfactory but incomplete for a good cause)*
- IP, *in progress*
- P, *passed (grade C- or better)*
- NP, *not passed*
- S, *satisfactory*
- U, *unsatisfactory*

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

Grade-Point Average (GPA)

The grade-point average is computed on courses undertaken in the University of California, with the exception of courses undertaken 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. 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 page 59).

Passed/Not Passed (P/NP) Grading Option

Subject to regulation by the faculties of the various colleges and schools, an undergraduate student in good standing can petition to take specific courses on a Passed/Not Passed basis. Petitions are available in deans' offices as of dates published in the *Class*

It's hard to keep grades from interfering with my academic interests, but I've found that the most interesting work I've done is valuable to me regardless of how it's graded.
— Senior,
American Studies

Schedule and Room Directory and must be filed 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 disregarded 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 1/3 of the units completed in residence on the Davis campus.** Consequently, at least 2/3 of the units completed in residence at Davis and presented in satisfaction of degree requirements must be in courses taken for a letter grade. Your quarterly transcript will show the total number of units graded P you have accumulated, as well as the number of units graded P that are in courses taken on a P/NP basis at your option. 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 elect the P/NP grading option for courses graded upon completion of a two- or three-quarter sequence (In-Progress grading), a petition submitted by the end of the fifth week of the first term applies to all terms of the course. A petition submitted during the second term but before the end of the fifth week of the second term applies to the second and any remaining terms of the course.

Courses in which a D or F are received may *not* be repeated with the P/NP option. Students who received an Incomplete in a course they undertook for a letter grade may not complete the course on a Passed/Not Passed basis.

Satisfactory/Unsatisfactory (S/U)

Graduate students, under certain circumstances, may be assigned grades of S or U, but units gained in this way will not be counted in calculating the grade-point average. 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.

Petitions are available from the Graduate Division and must be signed by your graduate adviser. (See page 129 for Individual Study courses.) Courses in which a D or F grade is received may *not* be repeated with the S/U option.

Passed/Not Passed (P/NP) Grading Only

In specific courses which have been approved by the respective departments and by the appropriate Committees on Courses of Instruction, individual instructors will assign *only* Passed or Not Passed grades. (See page 128 for Special Study courses.)

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 in successive quarters.

Incomplete Grades

The grade of I may be assigned when a student's work is of passing quality but is incomplete for a good cause. 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 course work as specified by the instructor. In order to change your records, you must obtain a petition from the Registrar's Office 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 term 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, the time limit for conversion for the graduated student will be the end of the third regular term succeeding the term in which the Incomplete was assigned.*

Courses for which an I grade has been assigned may not be repeated except on an audit basis. An undergraduate student whose record shows more than 16 units of I grades will be subject to disqualification (see page 59). 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 or NP, depending on what 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 term. No final grade except I may be revised by examination or the submission of additional work after the close of the term.

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



Repetition of Courses

An *undergraduate student* may repeat only those courses taken on a UC campus in which he or she has received a grade of D, F, or NP. In computing the grade-point average of an undergraduate who repeats courses in the University in which a D or F was received, only the most recently earned grades and grade points are used for the first 16 units repeated. Thereafter, you will receive the grade assigned and the corresponding grade points earned for each time you take the class. When a course is repeated, the units completed will be credited toward the degree only once, but the course will appear on your record each time it is taken. Repetition of a course more than once requires approval by the appropriate dean in all instances. Courses in which you have received a grade of D or F must be taken for a letter grade if repeated — not on a P/NP basis. (Courses in which a grade of NP was received may be repeated on a P/NP basis.)

A *graduate student* may repeat any course in which a grade of C, D, F, or U has been earned, up to a maximum of nine units. A course in which a C, D, or F grade has been earned may not be repeated on the S or U grading basis. In computing the grade-point average of a graduate student who repeats courses in which a grade of C, D, or F was received, only the most recently earned grade for each course and corresponding grade points shall be used.

Mid-Term Grade Standing

Students wishing to know their grade at the mid-quarter should inquire with 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. If you wish to have your grades mailed to you, deposit a stamped, self-addressed envelope with the Registrar's Office before the end of the term.

Transcripts

A record of each student's academic work at UCD is prepared and retained permanently by the Registrar's Office. Copies of your official transcript may be obtained from the Registrar's Office for \$2 for the first copy and \$1 each for additional copies requested at the same time. Transcripts of all work done through University Extension or Concurrent Enrollment should be requested directly from the University Extension Office, 4485 Chemistry. 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 one week in advance of the time needed.

CLASS LEVEL

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

Class Level	Unit Breakdown
Freshman	0 - 40
Sophomore	40½ - 83½
Junior	84-134½
Senior	135 -

EXAMINATIONS

Final Examinations

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 at the beginning of the term so that you can avoid final examination conflicts.

Except under certain specified circumstances, Academic Senate Regulations require that final examinations be given in all undergraduate 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 of a take-home and an in-class final examination together should not exceed three hours. In each undergraduate 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*. The scheduling of an examination at a time other than the specified time requires the mutual consent of the instructor and each student enrolled 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. 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 his or her college by the end of the next regular term for appropriate action.

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

This may be the last chance you'll ever have to experiment where mistakes won't count against you too much. So take advantage of everything you've always wanted to do.

— Junior,
Economics

College Entrance Examination Board (CEEB) Advanced Placement Examination Credit

You are awarded 10 quarter units of credit toward the 180-unit bachelor's degree requirement for CEEB Advanced Placement Examinations satisfactorily passed, usually during the junior or senior year in high school. (Exception: 5 units are awarded for a score of 5, 4 or 3 earned in the Mathematics AB exam and each Latin exam, and 10 units for one or both of the Physics B and C exams.)

You may not earn University credit for courses which duplicate credit already allowed for Advanced Placement Examinations (see UCD Course Equivalencies column below). Exceptions for biology and chemistry are noted below. If you have not received your exam results, carefully avoid enrolling in a UCD course for which credit may not be granted. Exam scores will be posted on the bulletin board opposite Room 175, Mrak Hall as soon as they are made available to the University.

The following information applies to undergraduate students in the Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science. For further clarification consult the office of your college.

EXAMINATION	SCORE	UCD COURSE EQUIVALENCIES	CONTINUING COURSE	CREDIT ALLOWED TOWARD SPECIFIC DEGREE REQUIREMENTS
ENGLISH English	5, 4, 3	English 1 and 3		English/Humanities Credit College of Agricultural & Environmental Sciences: 4 units English credit. Four additional units required in English or rhetoric in consultation with major adviser. College of Engineering: 8 units English credit. Satisfies English 1 and 4 units of Humanities & Social Sciences elective. College of Letters & Science: 4 units Humanities credit. Partially satisfies English Composition requirement (course route option)
FOREIGN LANGUAGES French German Latin (Vergil) (Lyric) Spanish	5, 4, 3 5, 4, 3 5, 4, 3 5, 4, 3 5, 4, 3	French 6 German 4, 6A or 6B Latin 103 Latin 105 Spanish 5	French 30A or any upper-division literature course. Any upper-division course; German 101 strongly recommended. Determined by consultation with Classics adviser. Determined by consultation with Classics adviser. Spanish 28.	Humanities Credit/Unrestricted Electives 4 units For each foreign language examination passed. In the College of Letters & Science, these examinations also satisfy the Foreign Language requirement.
HUMANITIES Art Studio Art History American History European History Music	5 4 5, 4 3 5, 4, 3 5, 4, 3 5, 4, 3	Art 2, 5 Art 2 Art 1A, 1B, 1C Art 10 History 17A, 17B History 4B, 4C Music 10	Art 3. Art 3 or 4.	Humanities Credit/Unrestricted Electives 8 units 4 units 10 units 4 units 8 units Satisfies American History & Institutions requirement. 8 units 4 units
NATURAL SCIENCES Biology Chemistry Mathematics AB BC Physics B B CI CI CII CII	5, 4 3 5, 4, 3 5, 4, 3 5, 4, 3 5 4, 3 5 4 5 4	Biological Sciences 1 and Botany 2 or Zoology 2-2L Biological Sciences 1 Chemistry 1A, 1B Mathematics 11, 21A Math 11 21A 21B Phys 1A 1B 10 2A 2B 2C Physics 10 Physics 1A, 2A or 8A Physics 1A or 2A Physics 1B, 2B, or 8B Physics 1B or 2B	Any appropriate upper-division course in the biological sciences. Bacteriology 2, Botany 2 or Zoology 2-2L. Bacteriology 2, Botany 2 or Zoology 2. Mathematics 21B. Mathematics 21C. Determined by consultation with adviser.	Natural Sciences Credit/Preparatory Courses for Science Majors 10 units Student has option of taking Botany 2 or Zoology 2-2L for full credit. In the College of Engineering, 5 units apply toward the "Basic Science and Mathematics or Technical electives." 10 units 10 units Credit for Chemistry 1A and 1B equivalence may serve as prerequisite to 1C with the instructor's consent. While 1A and/or 1B may be taken for full credit, the 4A-4B-4C sequence is preferred. 4 units Students who achieve a score of 5 or 4 may, with the instructor's consent, enroll in Mathematics 21C 8 units 10 units No credit for laboratory parts of Physics 4 or 3. 10 units Course equivalents may be used as prerequisites for succeeding courses of same series by consent of the instructor. Any equivalent course may be taken for full credit with consent of the instructor and curriculum committee, but probably disallowed if a high score is achieved on the examination 4 units 4 units 4 units 4 units Note: In the College of Engineering only a score of 5 on the CEEB (CI and CII) Examinations applies toward the physics requirement

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 enrolled 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.

Credit by Examination

Under certain prescribed conditions, currently enrolled students in good standing may receive course credit by taking an examination without formally enrolling in a course. You may obtain a petition and a copy of the prescribed conditions from the Registrar's Office. 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, 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 the Graduate Division.

The credit received for the examination may not duplicate any credit you have already applied toward your degree. The final results will be reported to the Registrar who 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.

SCHOLARSHIP DEFICIENCIES

The following provisions apply to all undergraduate students in the Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science. 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 within the University and for the work undertaken in any one term.

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

- is less than 2.0, but not less than 1.5, for the term
- 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 term,

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

- the student has spent two consecutive quarters on academic probation without achieving a cumulative grade-point average of 2.0.

The *quantitative standards*, referred to as **minimal progress requirements**, define scholarship in terms of the number of units that must be satisfactorily completed. Minimal progress requirements do not apply to students enrolled in the Part-Time Degree Program or to students who have their dean's approval to carry less than the minimum program load because of medical disability, employment, a serious personal problem, a death in the immediate family, or an accident.

"*Below minimum progress*" will be noted on the transcript the first time the total number of units passed at UCD is less than:

- 36 at the end of the third term of enrollment
- 72 at the end of the sixth term of enrollment
- 108 at the end of the ninth term of enrollment
- 144 at the end of the twelfth term of enrollment
- 180 at the end of the fifteenth term of enrollment

"*Below minimum progress; subject to disqualification. Continued registration will be at the discretion of the dean of your college, and any questions should be directed to the dean,*" will be noted the second consecutive time the total number of units passed at UCD is less than those listed above.

Once a student is in good standing and has met quantitative standards for scholarship, the notations will be removed from the transcript.

It is assumed that a student will earn 180 units and obtain a degree prior to the fifteenth term.

The following courses may be counted toward unit minimums:

- Required non-credit courses, e.g. Mathematics B, will be evaluated according to the "Carnegie unit" rule and counted as units passed (see page 127)
- Repeated courses passed to improve D or F grades
- Courses passed during Summer Session at UCD or at another accredited school and transferred to UCD shall be counted as units passed (applied to quarter of enrollment 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 graded IP (in progress) will be counted as units passed.

The faculty of a college may grant a student a minimum progress variance of one or more quarters for an acceptable reason. A student is given a warning on the first instance of failing to make minimum progress but is not removed from scholastic good standing. The second consecutive time a student fails to complete the



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required minimum number of units, continued registration will be at the discretion of the student's dean. Students who fail to make minimum progress may continue to take courses using their Passed/Not Passed grading option. Advising assistance should be obtained either through the student's own adviser or in the college Dean's Office.

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.

STUDENT RESPONSIBILITY

You are responsible for compliance 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 regulations of the University.

You will not receive grades, transcripts of record, teaching credentials, or diplomas until you have met all University obligations. Any past obligations which you have not satisfied or had officially extended may prevent your registration.

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. A standard for student conduct is outlined 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 the Vice Chancellor—Student Affairs, 541 Mrak Hall, and the Coordinator of Student Judicial Affairs, 466 Memorial Union.

A one sheet summary of student conduct expectations is distributed in the registration process. Misconduct for which students are subject to discipline includes, but is not limited to, plagiarism, cheating, knowingly furnishing false information to the University, forgery, and alteration or misuse of University documents, records, keys, or identification. Disciplinary sanctions which may be involved range from a warning to dismissal and/or restitution.

Alleged violations of campus or University standards will be investigated by appropriate officials, and may be referred to a hearing before the Student Conduct Committee, Campus Judicial Board, the Coordinator of Student Judicial Affairs, or another appropriate officer.



The President of the University, through the Chancellor, has ultimate authority for the administration of student discipline.

BACHELOR'S DEGREE REQUIREMENTS

Three groups of requirements must be satisfied before a student can become eligible for candidacy for the bachelor's degree. They are:

1. University requirements, which are general and apply to all schools and colleges;
2. College or school requirements; and
3. Individual major requirements.

For information on college, school, or major requirements, see the appropriate section of this catalog, the Registrar's Office, or college and school deans' offices.

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 Entrance Examination Board (CEEB) Achievement Test in English Composition.

The system is not inflexible. It's people who make rules and people who change rules, but you've got to question things!
— Junior,
Psychology



- By achieving a grade of 5, 4, or 3 in the CEEB Advanced Placement Examination in English.
- By entering the University with credentials showing the completion of an acceptable 3-semester 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 Diagnostic Examination. This examination may be taken only once. It is offered during the Summer Advising sessions and the Orientation period at the beginning of each quarter. Consult the "Orientation Calendar and Registration Events" published prior to the beginning of each quarter for time and location of the Orientation Week examination.

If you have not satisfied the requirement in one of the ways described above, you must enroll in English A during your first quarter of residence at the University, or as soon thereafter as space is available in the course.

International students whose native language is not English can meet the Subject A requirement by passing a special examination in English composition and, if necessary, completing English 25 (English for Foreign Students) with a minimum grade of C.

American History and Institutions

The American History and Institutions Requirement insures 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:
 Afro-American Studies 10, 100, 120, 121
 Asian American Studies 1, 2
 Economics 111A, 111B
 History 17A, 17B, 27A, 27B, 72A, 72B, 78A, 78B, 170A, 170B, 170C, 171A, 171B, 171C, 174A, 174B, 175A, 175B, 175C, 176A, 176B, 177, 179, 180A, 180B, 183A, 183B (upper-division courses may be taken only with the consent of the instructor)
 Native American Studies 20, 116, 130A, 130B, 130C, 155
 Political Science 1, 5, 5D, 100, 101, 102, 103, 104, 105, 106, 108, 109, 113, 127, 128, 160, 163

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

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- 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 studying at the University with F class (student) or J class (exchange visitor) visas should contact the Registrar's Office to secure exemption from this requirement. Bring your passport, visa, and registration card with you.

Further information may be obtained from the Supervisor of the American History and Institutions Requirement, 124 Mrak Hall.

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 candidate must be earned in residence in the college or school in which the degree is to be awarded; no more than 18 of these 35 quarter units may be completed in summer session courses at UCD.

There are additional residence requirements in the College of Letters and Science (see page 93). 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 award 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 for all courses you have attempted in the University. An exception to this rule is authorized for those students undertaking certain honors courses. For specific college and school requirements consult the appropriate sections of this catalog.

Unit Requirement

A minimum of 180 quarter units is required for graduation. These must be distributed according to the mini-



minimum requirements set forth by the faculty of your college or school (see individual college and school sections of this catalog).

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.

Filing for Degree Candidacy

Each candidate for an undergraduate degree must file an Announcement of Candidacy with the Registrar at the beginning of the quarter in which the candidate plans to receive the degree. The dates for filing are published in the calendar on page 6.

HONORS AND PRIZES

Deans' Honors List

According to Davis campus regulations, the quarterly Dean's Honors List is comprised of names of students who have completed, for a letter grade, a minimum of



12 units in a specific term 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 the preceding term. Any additional regulations set by a particular college will be stated within that section of this catalog. Honors Lists will be posted quarterly on bulletin boards outside Dean's Offices, and a notation of these honors will be placed on each student's permanent record in the Registrar's Office.

Scholarships

Students with outstanding academic records and 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 (see page 41).

Graduation Honors

The current program for honors at graduation is being phased out. See specific College sections for minimum grade-point averages required to qualify for honors.

Following is a description of the new honors program effective for Fall 1982:

Honors at graduation will be awarded to students who have completed units of credit in the University with a grade-point average which places them in the corresponding top percentage of the graduating class of their college or school, based on the most recent grade report available (normally winter term grades for candidates for June in each year) as shown in the following table:

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

All students having the same grade-point average as that of the student who falls at each percentage cut-off point as specified in the table above will be awarded the same category of honors as that student. The grade-point averages which mark the cut-off points for each honors category for the June graduating class will be used as minimum criteria for the award of the same category of honors to students who graduate in summer sessions and fall and winter terms immediately following. Students should refer to specific College sections of this catalog for any additional requirements.

A notation of awards is made on the student's diploma and on permanent records in the Registrar's Office.

Prizes

The University Medal is the highest 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.

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 Omega Alpha (Medicine)
- Alpha Zeta (Agriculture)
- Omicron Nu (Home Economics)
- Order of the Coif (Law)
- Phi Beta Kappa (Liberal Arts)
- Phi Kappa Phi
- Phi Zeta (Veterinary Medicine)
- Pi Mu Epsilon (Mathematics)
- Pi Sigma Alpha (Political Science)
- Prytanean Society (Women)
- Sigma Xi (Research)
- Tau Beta Pi (Engineering)

*It's true there's an
"open door" policy
here — you just
have to be brave
enough to knock.
— Sophomore,
English*



College of Agricultural and Environmental Sciences

Information:
College Office
228 Mrak Hall
752-0107

Challenges and opportunities arising from social and technological changes characterize these times. Today's challenges — protecting the environment from man's diverse activities, improving nutrition in major segments of the population, developing and utilizing human and renewable natural resources — are reflected in the programs and offerings of the College of Agricultural and Environmental Sciences.

Teaching and research in the College now extend far beyond the traditionally important mission of food and fiber production. Activities range from the soil to the home, from the farms to the cities. The best uses of land and forest areas, as well as the control of water for home, agriculture, wildlife, recreation, and industry are studied. These areas, reflected in the 42 majors and programs in the College, offer interesting and practical career opportunities.

Social problems as well as technological advances are major College considerations. The goal is to develop concern within people; a concern not only with the technology but with the human problems that such technology might create. Through the application of the biological, physical, and social sciences to resource management, farming, ranching, business, education, conservation, recreation, the family, and the community, College programs are designed to meet today's challenges and contribute significantly to effective solutions for tomorrow's problems.

ADMINISTRATIVE STRUCTURE

The College's administrative structure was designed by students, faculty, and administrators to insure the flexibility, responsiveness, and rigor of programs in the face of continually changing educational needs. An ongoing review and updating of teaching programs is the result of faculty and administrative concern not only with providing good teaching, but also with student receptiveness to subjects being taught.

The College is organized to help students determine what they want and need to learn — and then to assist them in learning it. Furthermore, the focus of the College's programs is on activities for which there is a societal demand, and on providing opportunities to explore the usefulness of classroom work in study-internship situations.

STUDENT RESPONSIBILITY

In recent years, student point of view has had a significant impact on both educational programs and College governance. Students participate in designing the College's programs and are included on College, departmental, and general faculty committees that determine a wide spectrum of educational and administrative policies. If you want to take part in the committee system, express your interest to the College Office, 228 Mrak Hall.

Teaching excellence depends on constructive help from all students. As full participants in the educational process, students are expected to provide faculty advisers, departmental chairpersons, and the deans with candid appraisals of College programs. The College also uses questionnaires to evaluate the success of its programs and to determine immediate student reactions to courses and instructors. You are encouraged to communicate with the College Office at any time, in person or by letter, concerning the impact of College programs on your education or ways in which these programs may be improved. Such information is very important in planning to meet the educational needs of future students.

PROGRAM PLANNING

Your Role

Although many services are provided to assist in program planning, in the last analysis you are the one who determines which program to pursue. The most crucial

I think it's worth it to go out of your way to talk to professors in their offices. They seem to appreciate knowing students as individuals as much as students like to know professors as individuals.
— Senior,
Economics

decision you make in this process is selecting your educational objectives. These may or may not require enrollment in a university. As part of making this decision, you should investigate the educational opportunities in the College by visiting the campus before applying for admission and talking with the deans, faculty members, and students. If the University is to be a means of reaching a career decision, you should examine its potential for meeting your goals.

Once you decide to enroll in the College and have chosen an educational objective, be it specific or exploratory, the College's advising services can be of assistance. Our advisers know the resources of the College and can help you use them to accomplish specific goals. The advisers can, in fact, be called upon long before you arrive on campus. High school students desiring information about college preparatory programs and college students contemplating transfer are encouraged to seek guidance from our deans and faculty advisers as early as one or two years before coming to the Davis campus. This is best done in person, although information can be provided by letter or phone.

It has been the experience of advisers that much of the inflexibility attributed to College programs exists only in the mind of the student. Recommendations meant to serve as guides are sometimes misunderstood to be hard and fast rules. The phrase "courses normally taken by students" often leads students to believe the courses are specifically required when they are not.

The concept of prerequisite knowledge is particularly misunderstood. Education is a building process. It is difficult or impossible to learn advanced principles without first understanding elementary ones. As a matter of convenience, most students acquire preparatory knowledge through prerequisite courses, but that is not the only route available. If you have acquired the prerequisite knowledge by other means, you need not take the specified prerequisite. Instructors will often indicate on the basis of informal discussions that you are prepared for advanced study without the need for courses. Courses may also be challenged by examination (see page 59).

Flexibility in planning has also been constrained by the belief that students in one college may not take courses in other colleges. This is *not* true. Within the boundaries of enrollment limitations and Academic Senate policy — and your ability to acquire useful knowledge as a result of taking a particular course — you may enroll in almost any course listed in this catalog.

College Services

University life is a complicated, sometimes bewildering experience. For example, although you may have the academic side of your life under control, you may need a small "assist" to deal with some other area, such as registration. The College offers a variety of ways that you can obtain advice or help in solving such problems. Some of these are described in the sections following.

Faculty Advisers

You will be assigned a faculty adviser to help you plan a program that corresponds to your individual educational interests. The assignments are made by Master Advisers, each of whom is responsible for coordinating advising within a major. If you have not decided on a specific major, you will be assigned to the Exploratory Program. In this case, you will have an adviser especially familiar with the breadth of course offerings available in this and other colleges. On the other hand, if you have well-defined educational objectives, you will be assigned an adviser with the training and experience required to facilitate your program planning.

The function of advisers is to sensitize students to the educational opportunities at Davis, to discuss the implications of one option or another, and generally, on the basis of experience, to help students achieve their educational goals. The great potential which an adviser-student relationship can have has long been recognized within the College, and you are strongly urged to consult with your adviser each quarter prior to selecting your courses.

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

Advising Centers

General advising on academic programs is available at the College's Academic Advising Center, 122 Hoagland Hall, where all advising activities in the College are coordinated.

Each of the Subject Matter Areas (SMA) of the College (see page 68) has an Advising Center staffed by advising associates knowledgeable in all aspects of University and College rules and regulations, courses, specific requirements of majors in that SMA, career opportunities, etc. Peer advisers for the SMA are also available at each location.

Peer Advisers

Student advisers are available in the College's Academic Advising Center, in other advising centers, and at The First Resort (see page 28). These peer advisers keep themselves up to date on the "how's," and "where's," and "why's," of University operating procedures. They are prepared to answer a variety of questions about courses, requirements, and enrollment procedures, and are both a source of information and a means of referral to the right person or office for action.

Associate Deans of Resident Instruction

The College has associate deans responsible for each of the following subject areas: Animal Science; Applied Economic and Behavioral Sciences; Biological Sciences; Food, Nutrition, and Consumer Sciences; Plant Sciences and Pest and Disease Management; and Resource Sciences and Engineering. They welcome the opportunity to become acquainted with individual



students and to talk informally with them. They can also help you with academic problems if you are placed on probation or subject to dismissal.

Orientation Class

Each quarter the College offers an orientation class (see page 264) to introduce students to the University, to aid them in formulating educational objectives, and to help them identify the many educational opportunities at UCD. Although not required, this course is recommended as a useful means for discovering what the Davis campus and the College of Agricultural and Environmental Sciences are all about.

Expanded Course Descriptions

Most of the majors available in the College of Agricultural and Environmental Sciences allow for considerable freedom in selecting courses. You may find, however, that because of space limitations the descriptions in the Catalog will not include all the information you would like about a course. The faculty of the College has responded to this need by writing the "Expanded Course Descriptions" giving more detailed explanations about each of its course offerings. 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, bases for grading, course format, detailing of 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 Dean's Office, advisers' offices, advising centers, departmental offices, The First Resort, and in the dormitories at the head residents' offices.

Work-Learn Opportunities

The Work-Learn and Career Planning and Placement Office assists students in arranging supervised internships — full-time or part-time — for the summer or for any quarter of the academic year. By participating in a work-learn experience students have an opportunity to try various work situations and test their career aspirations and objectives.

Some work experiences are introductory in nature and demand a limited time commitment and have no academic credit involved. Others require more intensive work and may offer academic credit or salaries. Freshmen and sophomores who wish to secure credit for an internship may arrange for enrollment in a 92 or 192 course through the appropriate department and Work Learn and Career Planning and Placement Office. Students must complete at least 84 units in order to enroll in a 192 course. (See page 128 for details.) A maximum of 12 units of internship courses and 20 units of variable-unit courses (see College requirement on page 70) may be counted toward the 180 units required for graduation.



*Whatever you do,
get an internship
or two or three
while you're here.
It's the only way to
get an idea if you
really like DOING
what you like
studying.
— Senior, Child
Development*



MAJORS AND SPECIAL PROGRAMS

Choosing a Program

There are several alternatives available to undergraduate students in the College of Agricultural and Environmental Sciences:

- A regularly established major program
- An individually designed major program
- A preprofessional program
- The exploratory program eventually leading to one of the first two alternatives above

The majors and special programs in the College are listed below according to Subject Matter Areas. Questions regarding a major should be addressed to the appropriate associate dean. Complete outlines of these majors and programs are presented in the Majors and Courses section of this catalog.

If you fulfill the requirements for more than one major in the College, that accomplishment can be noted in the memorandum section on your transcript. Requests for certification of multiple majors should be made in the College Office. Additional majors should also be indicated on the Candidacy Card when filing for graduation.

ANIMAL SCIENCE — G.A.E. Gall, Ph.D., Associate Dean

College Office, 228 Mrak Hall, 752-6970

Majors in Animal Science:

Animal Science
Avian Sciences
Wildlife and Fisheries Biology

Interdisciplinary Major:

Agricultural Science and Management

APPLIED ECONOMIC AND BEHAVIORAL SCIENCES — Warren E. Johnston, Ph.D., Acting Associate Dean

College Office, 228 Mrak Hall, 752-6360

Majors in Applied Economics:

Agricultural and Managerial Economics
Development, Resource and Consumer Economics

Majors in Behavioral Sciences:

Agricultural Education
Applied Behavioral Sciences
Design
Environmental Planning and Management
Environmental Policy Analysis and Planning
Human Development
Native American Studies

BIOLOGICAL SCIENCES (an Intercollegiate Division)

— Donald L. McLean, Ph.D., Divisional Dean
Division Office, 150 Mrak Hall, 752-0391

Majors in Biological Sciences:

Bacteriology
Biochemistry
Biological Sciences
Botany
Genetics
Physiology
Zoology



FOOD, NUTRITION AND CONSUMER SCIENCES

— J. R. Whitaker, Ph.D., Associate Dean
College Office, 228 Mrak Hall, 752-6971

Majors in Food Sciences:

Fermentation Science
Food Biochemistry
Food Science

Majors in Nutrition:

Community Nutrition
Dietetics
Nutrition Science

Majors in Consumer Sciences:

Consumer Food Science
Home Economics
Textiles and Clothing
Textile Science

Individual or Interdisciplinary Majors:

Exploratory (non-degree program)
Individual Major

PLANT SCIENCES AND PEST AND DISEASE MANAGEMENT

— J. M. Lyons, Ph.D.
Associate Dean
228 Mrak Hall, 752-0819

Majors and Programs in Plant Sciences:

Plant Science
Preforestry (non-degree program)
Range and Wildlands Science

Major in Pest and Disease Management:

Entomology

Interdisciplinary Programs:

Agrarian Studies
International Agricultural Development



RESOURCE SCIENCES AND ENGINEERING

Leonard O. Myrup, Ph.D., — Associate Dean
College Office, 228 Mrak Hall, 752-0110

Majors in Resource Sciences:

Atmospheric Science
Environmental Toxicology
Renewable Natural Resources
Soil and Water Science

Major in Agricultural Engineering:

(See College of Engineering, page 80)

Exploratory Program

Sometimes you may be undecided about the major you really want to pursue. Or you may want to learn more about the alternatives available to you in the College. The Exploratory Program permits you, with the assistance of selected advisers, to choose courses in order to pinpoint your interests and aptitudes. This is not a degree program, but is an *aid in finding the major that best meets your needs*. You should not expect to stay in the program beyond 120 units, however, as it may delay graduation. For registration purposes, indicate *Exploratory* on your admissions materials and study list cards. Advising information is available from the College's Academic Advising Center, 122 Hoagland Hall.

Individually Designed Major Programs

You may design an individual major if you have a specific academic interest not represented by an established major. Such a major requires the selection of interrelated courses totalling 45 upper-division units from two or more areas of study. After preliminary consultation about this special program with the Master Adviser for the Individual Major, you then plan your major with at least two faculty advisers. The proposed program must be submitted to a special committee for review *at least four quarters before you plan to graduate*.

Titles of some individually designed major programs developed recently by students are: Business Management and Human Relations, Community Health, Creative Therapeutic Recreation, Human Ecology, Hydrometeorology, Physical Therapeutic Science, Psychobiology, Recreation Planning, Environmental Design, Vocational Therapy, and Environmental Education.

Additional information may be obtained by contacting the College's Academic Advising Center, 122 Hoagland Hall. (Also see page 230.)

Preprofessional Programs

The preprofessional program in forestry is a two-year plan which prepares students for entering a degree program in forestry or conservation. Davis does not offer a bachelor's degree in forestry; however, advisers in the College can help you prepare a lower-division program that will provide a basis for continuing work at another school. (Also see page 108.)

Preprofessional training requirements for application to professional schools, such as schools of veterinary medicine, law, or medicine, may be satisfied through programs in the College. You should select an undergraduate major on the basis of individual interest and aptitude; no one major will give you an advantage toward admission. Advisers in the College are well-informed about professional requirements and will help you integrate them into your major program. You can obtain more information by contacting the College Office, 228 Mrak Hall; the Office of the Associate Dean — Student Services, School of Veterinary Medicine, 1024 Haring Hall; the Health Sciences Advising Office, South Hall; or the Pre-Law Advising Office, South Hall.

Teaching Credentials

Inquiries concerning preparation for teaching credentials in agriculture and home economics should be addressed to the Department of Applied Behavioral Sciences, University of California, Davis 95616.

For general information on obtaining the teaching credential, see page 105.

REQUIREMENTS FOR THE BACHELOR'S DEGREE

It is your responsibility to see that all requirements for graduation are fulfilled. In brief, these are:

University Requirements: See page 60.

College Requirements: You must fulfill the Bachelor of Science requirements in a major as prescribed by, or individually designed and approved by, the faculty. Of the required 180 units counted toward a degree

- Not more than 6 units can be Physical Education 1
- Not more than 20 units can be courses numbered 92, 99, 192, 197T, or 199
- 54 units must be upper-division work
- At least 8 units (which must be earned before you have completed 120 units) must be earned in

courses in English, or English and rhetoric, or their equivalent, that emphasize written or oral expression. The following UCD courses have been approved for satisfaction of this College requirement:

1. 4 units must be selected from English 1, 2, 20, or 103 (courses with primary emphasis on writing skills).
2. 4 units from one of the unused courses above or from English 3, 104; Comparative Literature 1, 2, 3; Philosophy 5, 10; Rhetoric 1 or 3 (courses emphasizing either writing or speaking skills).

Major Requirements: See requirements under specific majors in the Majors and Courses section of this catalog.

Natural Sciences, Social Sciences, and Humanities Requirements (Breadth Requirements): Since the broadening effect of any particular course is dependent on your major and general interests, it is not possible to be specific as to what is desirable and what is not. (For example, natural science courses would add more breadth to an Agricultural and Managerial Economics major than they would to a Biochemistry major.) Your faculty adviser has guidelines for each major showing what courses you should consider.

Filing for Graduation: You must file a Candidacy Card with the Registrar's Office during the first two weeks of the quarter in which you plan to graduate (see page 63). You must also see your faculty adviser and complete your Major Certification; this form must be received and evaluated by the Dean's Office before your candidacy for a degree can be finalized.

COLLEGE POLICIES AND PROCEDURES

Study List and Major Plan

The study list is a record of the courses in which you enroll during a particular quarter. It should be part of a larger plan for exploration or 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 page 59).

In conjunction with an adviser, you must prepare a written plan that specifies your goals and shows how your graduation requirements will be met. This plan must be filed with your adviser by the end of the second quarter of your junior year (before completing 120 units, in residence or by transfer). Your adviser will then notify the Dean that you have filed your plan.

You will be denied registration for future quarters if you do not comply with this regulation. However, filing this plan does not preclude a change of major or program modifications.

Students need to be more flexible. I've seen a lot of students around here who decide that they are going to Med School and that's it.
— UCD Alumnus

Probation and Disqualification

Students are expected to make reasonable progress toward fulfilling the degree requirements. You must pass at least 36 units during each three terms of enrollment on the Davis campus in order to maintain a *good standing* status. Refer to page 59 for minimum requirements for subsequent quarters of enrollment and regulations on probation and disqualification.

Passed/Not Passed Option

If you are a regular student *in good standing*, you may elect to take certain courses on a Passed/Not Passed basis. (See page 55 for complete information.)

By using the Passed/Not Passed option, you can take courses in new areas without the pressure of competing with students who are majoring in the subject. This option should be used only for elective courses, however, not for courses taken to fulfill major requirements. When in doubt, check with your adviser before electing to take a course Passed/Not Passed.

Credit by Advanced Placement Examinations

(See page 58.)

Transfer Students

If you transfer to UCD from another institution, the Admissions Office will determine the unit credit you will be awarded for previous work. The College evaluates the credit awarded by the Admissions Office and determines how many units will be counted as upper-division work. Your faculty adviser then determines how the credit applies toward completion of the major requirements.

In order to make program planning easier for transfer students, the major requirements listed in the Majors and Courses section of this catalog have preparatory subject matter set out in a special category. These preparatory courses may be taken at the University of California or elsewhere. You can generally determine the area of knowledge covered by a specific requirement by reading the course descriptions. You need not present identical courses, only ones that have substantially similar content. If you are attending a community college, consult your counselor to determine which community college courses are appropriate and acceptable for fulfilling College of Agricultural and Environmental Sciences requirements.

If you have questions as to the best way to prepare for transfer to the Davis campus, you are encouraged to write directly to the associate dean responsible for your intended major (see pages 68-69) or plan a visit to the campus to discuss your program with a faculty adviser.

Registration Beyond the 195-Unit Limit

A minimum of 180 units is required for a bachelor's degree. You are normally expected to fulfill all degree requirements by taking 180 to 195 units.

Registration beyond 195 units requires permission from the Dean. If you must exceed 195 units before you complete four years of college study, permission is usually automatic. Beyond the fourth year of college study, permission is granted only for unusual circumstances and only for a limited time. *Approval must be obtained before course enrollment materials can be made available for the quarter following completion of 195 units.* You must adhere to a specific program of courses and academic performance levels agreed upon.

HONORS

Undergraduate Honors

The Dean's Honors List, published at the end of each quarter, includes the names of all students in the College of Agricultural and Environmental Sciences who have completed at least 12 units on the Davis campus during the preceding quarter (exclusive of units taken on a Passed/Not Passed basis) and who have a grade-point average equal to or higher than the minimum grade-point average attained by the upper 16 percent of students registered in the same class and college during the preceding quarter.

Honors at Graduation

Graduating students who are completing their majors with distinction may be recommended for honors, high honors, or highest honors. The names of these students are announced at commencement, and this distinction is noted on their transcripts and diplomas. (See also page 63.) The minimum grade-point averages required to qualify for honors are as follows:

Total quarter units completed at UC	Grade-Point Average		
	Honors	High Honors	Highest Honors
135 or more	3.20	3.40	3.60
90-134	3.40	3.55	3.70
45-89	3.50	3.65	3.80
Less than 45	not eligible		

College Medal

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.

Scholarships

To encourage capable young men and women to pursue careers in the agricultural and environmental sciences, many companies and private individuals have established scholarships restricted to students in this college. You are encouraged to apply for these scholarships if you have a high scholastic standing and demonstrate exceptional performance. Certain scholarships also require proof of financial need. Information is available from the Scholarship Office, or from the College Office, 228 Mrak Hall. (See also the Scholarship section, beginning on page 41.)





College of Engineering

Information:
Dean's Office
2132 Bainer Hall
752-0553

Engineering is the profession in which the physical, biological, and social sciences are applied in a practical way for the benefit of mankind. As an engineering student, you will learn to observe and describe problems that deal with human needs and to seek useful solutions to these problems. Your skills upon graduation will be useful to you not only as an engineer, but also as a professional in management, sales, operations, manufacturing, and other fields.

Eighteen undergraduate engineering curricula, including six formal double-major programs, are offered at Davis. These are all four-year programs that lead to the degree of Bachelor of Science in Engineering. Within each curriculum, areas of specialization are available through the selection of suitable technical elective courses. If your specific career objectives are not compatible with the established curricula, an individual engineering major can be proposed.

With the exception of the individual major, the four-year undergraduate program is divided into two parts. The first part (the Lower Division Program) is made up of mathematics, physics, chemistry, humanities and social sciences courses, and certain introductory engineering courses. The Lower Division Program is essentially the same for all engineering curricula, with the exception of Chemical Engineering and the double major in Chemical Engineering/Materials Science and Engineering. The second part (the Upper Division Program) is made up of elective courses and a group of required technical courses pertinent to your intended major. Most of your senior year is elective, to be divided between technical and non-technical courses. The major programs are outlined on pages 180 through 183.

It takes more than four years of schooling to learn all you need to know about any profession. The objective of the undergraduate programs in engineering, therefore, is to form an appropriate foundation for a lifetime of learning. Extended learning after graduation—on-the-job

experience, individual study, extension courses, or formal graduate study—is an essential part of an engineering education. And since practical experience during your undergraduate years is also useful, you are encouraged to participate in engineering internship programs.

For information on graduate programs leading to the Master of Engineering, Doctor of Engineering, Master of Science, and Doctor of Philosophy degrees, or Graduate Certificate Programs, see page 87.

E.C.P.D. Accreditation

The following Engineering curricula are accredited by the Engineers' Council for Professional Development: Agricultural Engineering, Chemical Engineering, Civil Engineering, Electrical and Computer Engineering, and Mechanical Engineering.

ADMISSION TO THE COLLEGE OF ENGINEERING

Admission to Freshman Standing

There are no special requirements for admission to the College of Engineering other than the general University requirements beginning on page 45. It is recommended, however, that you take the following subjects (or integrated courses covering substantially equivalent material) during high school:

Subject Areas	Years
Algebra	2
Plane geometry	1
Trigonometry	½
Analytic geometry	½
Chemistry and/or physics	1

These subjects are prerequisite to certain basic courses in the freshman engineering program. You will be required to make up equivalent work if you are

admitted without this preparation. As a result, graduation could be delayed. A year of high school mechanical drawing is also recommended, but not required.

Advanced Placement Examination

Credit toward the total unit requirement for the degree is awarded for CEEB Advanced Placement Examinations satisfactorily passed, as indicated in the table on page 58. Except as otherwise noted in the table, these units may be used to satisfy specific graduation requirements in the College of Engineering.

Admission to Advanced Standing

While it is possible for community college students to transfer to UC Davis after completing only the freshman year, you are urged to take the entire Lower Division Program at the same school. After completing the basic lower-division engineering curriculum at a California community college, it is possible to complete your studies at Davis in two academic years. Questions about community college programs should be directed to your counselor, or you can contact the UC Davis College of Engineering Undergraduate Office directly. (For information on admission to the University in advanced undergraduate standing, refer to the Admission section of this catalog.)

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 two Lower Division Programs listed on pages 180-181. You are advanced to upper-division standing after completing 84 units.

If you are admitted with *84 or more quarter units*, you are classified in upper-division standing, but you are required to complete the minimum number of quarter units in the subject areas specified before your Lower Division Program is considered complete. You may, however, start your Upper Division Program while completing your Lower Division Program.

Subject Areas	Minimum Quarter Units
Mathematics (calculus, differential equations, vector analysis)	18
Physical and biological sciences (at least 10 units must be in general chemistry and at least 12 units in physics for engineering and science students)	27
Engineering (lower-division subjects such as graphics, properties of materials, surveying, computer programming, statics, and circuit theory. Chemical Engineering majors may elect to take only 12 units of engineering in their Lower Division Program)	15
Written and oral expression (courses equivalent to English 1, and Rhetoric 1 or 3)	8

Humanities-social sciences (must be selected from a list of course groups approved by the Committee on Undergraduate Study) 8

Unspecified subjects (Chemical Engineering majors should take quantitative analysis and one course in organic chemistry with laboratory during their sophomore year) 8

Total **84**

Once you have completed the Lower Division Program on this basis, it is not necessary to 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 Lower and Upper Division programs varies from 180 to 195.

Engineering is closed to Limited Status, Special Status, and Second Baccalaureate applicants.

CHANGE OF COLLEGE AND MAJOR

Petitions for change of major and transfer into the College of Engineering from another UCD college will be considered only from students who have completed at least 40 units of work on the Davis campus but not more than 150 units overall, and have completed Mathematics 21A, 21B, 21C, and Physics 8A or the equivalent. It may be necessary to limit the number of applications that are approved, in which case selection will be based on UC grade-point averages. These limitations on transfer into the College apply only to students who first entered UCD in March of 1979 or later. See page 54 for details on filing petitions.



ACADEMIC ADVISING

In establishing the College of Engineering's undergraduate programs, every effort has been made to provide for maximum flexibility consistent with rigorous preparation for professional practice or graduate study. The key to developing a flexible program for each student is an effective system of advising.

Every engineering undergraduate is assigned to a faculty member for academic and career advising, and every full-time engineering faculty member has 25 to 30 advisees.

Adviser assignments are made and coordinated through the College's Undergraduate Office, which assigns you an adviser prior to your first term on campus. New students who participate in the Summer Advising Program will have individual appointments scheduled with faculty advisers during the program. Other new students are asked to meet with their faculty advisers during the orientation period that precedes the first week of classes.

Since a close relationship between you and your faculty adviser can be one of the most important factors in a successful educational experience, you are encouraged to come into the Undergraduate Office and select a new faculty adviser whenever you wish.

Faculty advising is complemented by a well-developed peer advising system. Student advisers are available at the Student Center in Bainer Hall and at other locations listed in the index under Advising.

CHOOSING A MAJOR

The majors (curricula) in the College of Engineering are:

- Aeronautical Engineering
- Agricultural Engineering
- Agricultural Engineering (Forest Engineering option)
- Chemical Engineering
- Civil Engineering
- Electrical and Computer Engineering (General)
- Electrical and Computer Engineering (Computers)
- Electrical and Computer Engineering (Electronics, Circuits and Signal Processing)
- Electrical and Computer Engineering (Solid-State, Microwaves and Quantum Electronics)
- Materials Science and Engineering
- Mechanical Engineering
- Agricultural Engineering/Materials Science and Engineering
- Chemical Engineering/Materials Science and Engineering
- Civil Engineering/Materials Science and Engineering
- Electrical and Computer Engineering/Materials Science and Engineering
- Mechanical Engineering/Aeronautical Engineering
- Mechanical Engineering/Materials Science and Engineering
- Individual Engineering Major

Note that six of these are double majors. Degree requirements for each of these double majors can be completed in four academic years.

The Individual Engineering major is designed by you with the help of your adviser, and is subject to approval by the Engineering Undergraduate Study Committee.

Many students who enter the College of Engineering have well-defined career objectives. Others do not. All engineering students are formally classified as *Engineering—Lower Division* until 84 quarter units of college work have been completed. Your official designation of an engineering curriculum does not take place until the end of your sophomore year. If you are planning to graduate under the Chemical Engineering or the Chemical Engineering/Materials Science and Engineering curricula, however, you should make that decision during your freshman year and plan your entire program accordingly.

You are encouraged to make use of the many advising and counseling sources available to students if you are uncertain about your choice of a major. Guidance within the College is available through faculty and student advisers, instructors, and the academic deans. The Career Planning and Placement Office, Advising Services Office, Counseling Center, and other sources listed in the index under Advising are also good places to seek assistance.

Introductory Courses

A number of freshman engineering courses are designed to describe the engineer's role in society and to show the similarities and differences among various engineering branches. Included are:

- Engineering 3 (*Introduction to Engineering Systems*)
- Agricultural Engineering 1 (*The Agricultural Engineer in Tomorrow's World*)
- Chemical Engineering 1 (*The Scope of Chemical Engineering*)
- Civil Engineering 1 (*The Civil Engineer in Society*)
- Electrical and Computer Engineering 1 (*Introduction to Electrical and Computer Engineering*)
- Mechanical Engineering 1 (*Mechanical Engineering*)

PLANNING YOUR PROGRAM

You are held responsible for planning your program. But that does not mean you are simply on your own. Your faculty adviser, with whom you are strongly urged to consult prior to registration each quarter, is the primary source of assistance. The Undergraduate Office of the College is willing to assist, as are the many advising offices throughout the campus.

Specific degree requirements for the various engineering curricula are given beginning on page 180.

Students need to realize that the goal which they set out with when they begin school may not be the same goal they have when they graduate.
— UCD Alumnus

The minimum number of required units ranges from 180 to 195, depending on the curriculum. Programs normally require a minimum of 12 quarters of study averaging 15 units per quarter. Continuing students can enroll for no more than 21 units, and students in their first quarter of residence can enroll for no more than 17 units unless authorized by the Dean. See page 59 for regulations concerning the minimum rate of progress.

Sample arrangements that list the Lower Division and Upper Division Programs in a quarter-by-quarter sequence may be found in the *College of Engineering Bulletin*, available from the Engineering Undergraduate Office.

Program Flexibility

In the Lower Division Program for all curricula except Chemical Engineering, only mathematics, Physics 8A and 8B and the lower-division engineering courses are prerequisite to required upper-division engineering courses. These courses should be completed during your first two years. The other physics, chemistry, and humanities-social sciences courses in the Lower Division Program are requirements for graduation, and can be scheduled to suit your individual program.

In planning your four-year program, be careful to observe course prerequisites in order to avoid a delay in graduation. Course prerequisites are specified to help you avoid courses for which you are unprepared and to help the instructor establish a starting point for a given course. The prerequisites for any course may be waived by the course instructor, for good cause, for individual students.

Course Priorities for Freshmen

An extensive background in mathematics is a prerequisite to upper-division engineering courses. Therefore, if you are enrolled in engineering or are considering future enrollment, you should include mathematics in your program from the outset. Course priorities for the first quarter of your freshman year are suggested below.

- Mathematics 11 (if not completed in high school)
- Mathematics 21A (if not completed in high school)
- English A (if the Subject A requirement is not yet otherwise satisfied)
- Other (Engineering 3 or 4, English 1, Chemistry 1A or 4A, Rhetoric 1 or 3, or humanities-social sciences electives)

If you plan to graduate in the Chemical Engineering or the Chemical Engineering/Materials Science and Engineering major, or are considering the possibility, you should take Chemistry 4A-4B-4C in your freshman year.

Expanded Course Outlines

A file of expanded course outlines for all courses offered by the various engineering departments is available for student use at the Undergraduate Office of the College.

Special Courses

Special-Study Courses: You are limited to five Special-Study units (courses 99 and 199) per quarter. (See page 128.)

Work-Learn Programs: Internship courses, numbered 92 and 192, are designed to provide internship experience under the Work-Learn Program (see page 128). Further information is available from your adviser, the College Undergraduate Office, or the Work-Learn and Career Planning and Placement Center.

University Extension Courses: Appropriate courses taken under University Extension may be used for degree credit. Simultaneous enrollment in resident courses and Extension courses requires *prior approval* of the Dean of the College. Such approval will be given only for a limited number of credits. No grade points are assigned for courses completed in University Extension.

DEGREE REQUIREMENTS

YOU ARE RESPONSIBLE FOR PLANNING YOUR PROGRAM AND FOR SATISFACTORY COMPLETION OF DEGREE REQUIREMENTS.

Degree Requirement Check Sheets for each of the curricula are made available to students and advisers. The Undergraduate Office will prepare only one *unofficial* degree check for you (preferably at the beginning of your senior year) if you submit a signed Degree Check Request. Further information and forms concerning this service are available in the Engineering Undergraduate Office.

General University Requirements

University requirements for the bachelor's degree are explained beginning on page 60.

College 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 beginning on page 180.

You may, for good cause, request a modification of particular degree requirements by submitting a student petition. These petitions, available in the Undergraduate Office, can be a valuable aid in solving individual program conflicts or other special problems. Such petitions are subject to approval by the Undergraduate Study Committee, a body of five professors and five (non-voting) students. A negative decision by the Committee may be appealed to the College faculty for action at a regular meeting.

English Composition Requirement

The English Composition requirement may be satisfied in one of two ways:

1. By passing the English Composition Examination administered by the College of Letters and Science. (This examination is taken after completion of 84 quarter units of college work. It should be taken early in the junior year and must be taken prior to the last quarter before graduation.)
2. By completing any section of English 103 with a grade of C- or the equivalent, taken after completion of 84 units of college work.

This requirement is in addition to the expository writing course (English 1 or Comparative Literature 1, 2, or 3) specified in the Lower Division Programs.

During the 1980-81 academic year, the English Composition Examination will be offered on November 1, January 31, and April 25. Sign-up rosters will be available in 2132 Bainer Hall, Monday through Thursday of the week prior to each examination.

Degree Requirement Changes

Degree requirements in the various curricula in Engineering can change every year. Any student is free to choose to graduate under the requirements printed in the General Catalog in effect at the time of graduation, or under any of the *three* preceding catalogs.

Electives

There are four kinds of elective courses in the engineering curricula: *basic science and mathematics, humanities-social sciences, technical, and unrestricted.*

Basic Science and Mathematics electives: An engineering education is built on a solid foundation in the basic sciences and mathematics. That foundation provides a strong support for continuing academic and professional growth.

The purpose of the basic science and mathematics electives differs from the purpose of the technical electives. The former develop a fundamental base in the sciences, whereas the technical electives provide a direct opportunity for specialization.

The basic science and mathematics electives allow some selectivity in the choice of fundamental courses. For example, if you are interested in agricultural, biomedical, or environmental engineering, you may wish to select fundamental courses in the life sciences; or if you are planning a career related to the earth sciences, you can elect courses in geology. Most other career objectives are best served by courses in chemistry or mathematics.

The following courses are acceptable as basic science and mathematics electives. They must be taken for a letter grade.

Bacteriology 2	Genetics 100A
Biological Sciences 1	Geology 1, 1L
Botany 2	Mathematics 22A
Chemistry 1C or 4C, 5, 8A, 8B	Physiology 2
	Zoology 2

Humanities-Social Sciences electives: When a wise decision-maker examines an engineering problem, both scientific and humanistic components need to be considered. The humanities-social sciences electives are emphasized within the engineering disciplines to better prepare you for such decision making.

Each engineering program must include at least 23 quarter units from subjects in the areas of humanities and social sciences. A wide latitude is allowed in selecting these units. Subjects that are vocationally oriented, however, such as management and accounting, or which contain a preponderance of scientific or mathematical content, are not considered to be humanities — even though they are offered by a department ordinarily classified as a humanities or social science department.

All courses in the following categories, except courses 92, 97T, 98, 99, 192, 197T, 198, 199 and additional exceptions noted in parentheses below, are suitable as humanities-social sciences electives. If you repeat a course which may be repeated for credit, not more than 4 units of that course may be counted toward your humanities-social sciences requirement.

Afro-American Studies
Agrarian Studies
American Studies
Anthropology (except 13)
Applied Behavioral Sciences (except 160B)
Art (except 2, 3, 4, 5, 11, 16, 101-146)
Asian American Studies
Classics
Comparative Literature
Dramatic Art (except 25, 30, 124A, 124B, 124C, 124D, 180)
Economics (except 11A, 11B, 12, 103)
Education (except 100, 114)
English (except A, 1, 25, 26, 104)
Foreign languages (except 1)
Geography (except 1, 3, 4, 102, 105, 106, 107, 108, 110, 111, 112, 162)
History
Human Development
Integrated Studies
Linguistics
Music (except 1, 41, 43, 44, 45, 46, 141, 143, 144, 145, 146)
Native American Studies
Philosophy (except 12, 112, 133)
Political Science
Psychology (except 103, 108, 129, 131)
Religious Studies
Rhetoric (except 1, 3)
Sociology (except 46A, 46B, 106)

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, it is an opportunity to broaden their background in the sciences and engineering.



All upper-division courses in engineering, physics, chemistry, statistics, and mathematics (except Mathematics 101) are suitable as technical electives. If you are interested in expanding your knowledge of the basic sciences, you may choose technical electives from the lower-division courses listed under the basic science and mathematics electives. Many upper- and lower-division courses in the agricultural, earth, and life sciences — as well as a few in the humanities — qualify as technical electives.

Technical elective credit is allowed for engineering special-study courses (199's) up to a maximum of 5 units for each separate and substantially different project. Academic credit is allowed for engineering internship courses (192's), up to a maximum of 5 units per quarter; but a total of not more than 3 units of an engineering 192 may be counted toward technical elective credit.

Unrestricted electives: Any course for which University credit is allowed is acceptable as an unrestricted elective in the engineering curricula.

GRADING

Passed/Not Passed Option

(For general information on Passed/Not Passed grading, see page 55.)

While registered in the College of Engineering, you may enroll in a maximum of one course per quarter in which you choose the Passed/Not Passed (P/NP) grading option. 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 those units taken to satisfy the requirements for humanities-social sciences electives, English 1, Comparative Literature 1, 2, or 3, Rhetoric 1 and 3, unrestricted electives, or requirements identified in the appropriate Upper Division Program as "technical electives," may be taken on a Passed/Not Passed basis. All others (including re-



quired courses and basic science and mathematics electives) 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
- have a P/NP petition approved by the Dean or a designated representative

HONORS

The Dean's Honors List

The Dean's Honors List is posted quarterly on the bulletin board outside the College of Engineering Undergraduate Office. This list includes the names of all undergraduate Engineering students who have completed at least 12 units during the preceding quarter, exclusive of courses taken on a Passed/Not Passed basis, and who have achieved a grade-point average



I think engineering is one of the opportunities you have to make some impact on the lives of a lot of people — an obvious impact.
— Electrical Engineering professor

ENGINEERING UNDERGRADUATE CURRICULA

Aeronautical Engineering

Aeronautical engineering is the application of scientific knowledge to flight or movement in the atmosphere. Specific objectives are the design, development, and manufacture of airplanes, V.T.O.L. aircraft, and high-speed ground transportation systems. Within this context aeronautics becomes an essential branch of mechanical engineering in which knowledge in areas related to transportation is strengthened. For example, the aerodynamics and structural design of a high-speed train and a low-speed airplane have much in common. The undergraduate curriculum is intended to combine the fundamentals of basic engineering disciplines with those in the areas of aerodynamics, propulsion, controls, and aeronautical structures. This training is intended to prepare the student for technical leadership in this rapidly changing field.

A broad range of technical elective courses is available. You are encouraged to select these courses from among the several areas of specialization listed below.

AREAS OF SPECIALIZATION

Aeronautics and Transportation: Effective transportation requires vehicle operation under conditions which introduce many of the design problems that in the past have been considered unique to aeronautics. This area of specialization endeavors to provide students with the necessary background to work effectively in this expanding area of high-speed transport vehicle design and development.

equal to or higher than the minimum grade-point average attained by the upper 16 percent of those registered in the College at the same class level during that quarter. A notation is made on the student's records each time the student qualifies for the Dean's Honors List.

Honors at Graduation

Graduating students in the College of Engineering who have achieved distinguished scholarship while at the University may qualify for honors, high honors, or highest honors. The names of these students are announced at Commencement and this distinction is noted on their records and diplomas. Honors at graduation will be awarded to students who have completed the minimum number of units and acquired the grade-point average needed to qualify for honors. Contact the College Undergraduate Office for details. (See also page 63.)

College Medal

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.

Suggested technical electives:

Mechanical Engineering 124, 150A, 150B, 161, 162, 163, 172
Civil Engineering 131A, 131B
Electrical and Computer Engineering 157A, 157B
Applied Science 115
Engineering 106, 160, 190
Environmental Studies 160

Suggested advisers:

B.R. White, J.W. Baughn, P.G. Migliore

Low-Speed Aerodynamics: This area of specialization is intended for students who have an interest in the dynamics and aerodynamics of flight and should provide them with the necessary background in aerodynamics, structures, and propulsion to engage in design of low-speed aerodynamic vehicles.

Suggested technical electives:

Mechanical Engineering 124, 150A, 150B, 161, 162, 163, 165, 172
Civil Engineering 131A, 131B, 138
Electrical and Computer Engineering 150, 157A, 157B
Applied Science 115
Engineering 148, 190

Suggested advisers:

B.R. White, H. Brandt, P.G. Migliore

Agricultural Engineering

Agricultural engineers apply engineering principles to problems of food and fiber production, storage, and processing; animal and plant environments; agricultural wastes management; irrigation and drainage; and other phases of agriculture and related industries. Agricultural engineering is unique in that it requires a general understanding and appreciation of the biological and agricultural sciences, plus a thorough knowledge of basic and applied engineering.

The curriculum includes a substantial number of technical electives that make it possible for you to develop a broad program of study or specialize in one or more of the areas described below. The suggested technical electives listed for each area of specialization include courses that would enhance your knowledge in that particular area. The lists are not intended to be restrictive or all-inclusive.

Lower-division students planning to follow the Agricultural Engineering curriculum are advised to select their basic science and mathematics electives from courses such as Biological Sciences 1, Bacteriology 2, Botany 2, Physiology 2, and Chemistry 8A and 8B. Bacteriology 2 and Chemistry 8B are prerequisite to several of the suggested upper-division technical electives for the *food engineering and agricultural processing* area of specialization.

AREAS OF SPECIALIZATION

Food Engineering and Agricultural Processing is concerned with the conversion of agricultural products

into food, feed, or fiber. The engineering sciences of fluid mechanics, heat and mass transfer, and an understanding of biological materials, are applied in the analysis, design, and development of operations and systems for food manufacturing and agricultural processing. Concepts of sorting, cleaning, size reduction, handling, storage, refrigeration, drying, food manufacturing, and others are studied.

Suggested technical electives:

Agricultural Engineering 133, 134
Biochemistry and Biophysics 101A, 101B
Chemistry 5, 8A, 8B, 107A, 107B
Chemical Engineering 151
Electrical and Computer Engineering 150
Engineering 103B, 105B, 111
Food Science and Technology 104, 108, 111, 131, 150
Mechanical Engineering 165

Irrigation and Drainage applies engineering and scientific principles in the design and operation of irrigation and drainage systems. Emphasis is placed on use of water in agriculture, water quality, on-farm irrigation and drainage system design, water law, hydrology, and hydraulics.

Suggested technical electives:

Agricultural Engineering 140, 141
Atmospheric Science 105
Civil Engineering 141, 141L, 142, 144
Engineering 111
Water Science 103, 104, 110A, 110B, 141, 150, 154, 160, 172

Packaging and Handling involves the design of systems and packages to preserve product quality during handling, shipment, and storage, from origin to point of use. The properties of foods, environmental conditions, and packaging materials are studied, as well as the behavior of products and packages under dynamic, static, and long-term loading. The economic use of materials and of shipping and storage volumes are considered in the analysis and design of systems.

Suggested technical electives:

Agricultural Economics 114
Agricultural Engineering 125, 133, 134
Civil Engineering 161
Engineering 111, 122, 140
Food Science and Technology 111, 113, 131
Mathematics 133
Mechanical Engineering 152, 155

Power and Machinery involves the design, development, and application of field machines and power units for crop production. The economic aspects of mechanization and the effects of machines on soils, crops, and people are considered. Procedures for developing machine components and synthesizing them into engineering systems are studied.

Suggested technical electives:

Agricultural Economics 140

Agricultural Engineering 112, 114, 117, 118, 119, 157

Agricultural Engineering Technology 133

Civil Engineering 131A, 132A

Engineering 102B, 104B, 111, 122, 140

Mechanical Engineering 150A, 150B, 151, 152, 155

Structures and Environment emphasizes the design of agricultural structures. Various structures are analyzed for their functional effectiveness, efficiency of space and labor utilization, and economic value to an overall enterprise. The structure is considered as a means of providing an optimum environment for animal production, product storage and conditioning, or crop production in greenhouses. Environment modification, micrometeorology, and agricultural wastes management are studied.

Suggested technical electives:

Agricultural Engineering 125

Atmospheric Science 20, 105, 123, 124, 125, 131, 133

Civil Engineering 131A, 131B, 132A, 132B, 132C, 134, 147, 148A

Mechanical Engineering 165

Physiology 100A, 100B, 149

FOREST ENGINEERING OPTION

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 option is administered in cooperation with the Department of Forestry and Resource Management at UC Berkeley. Two or three quarters of your junior year are spent on the Berkeley campus, following a ten-week summer field course sequence at the UC Forestry Camp near Quincy.

Students who transfer to the University from another college to enter this program should apply for admission to the Davis campus even if they plan to attend the Berkeley campus before coming to Davis. These students, as well as those attending the Davis campus before going to Berkeley, obtain Intercampus Visitor status that authorizes them to register on the Berkeley campus for the quarters to be spent on that campus. Application forms for Intercampus Visitor status are available from the Department of Agricultural Engineering.

Suggested technical electives:

Atmospheric Science 105

Geography 161

Resource Sciences 100

Water Science 141

Forestry 105 (at Berkeley)

Any elective listed under Upper-Division Program for Forest Engineering Option and not used to fulfill a specific requirement

Chemical Engineering

Chemical Engineering is concerned with application of the principles of chemistry and engineering to the production of useful products. The products of the process industries range from antibiotics to zirconium, from petroleum to plutonium, from agricultural chemicals and foods to synthetic plastics. Chemical engineers are increasingly concerned with chemical and engineering processes related to the environment, food production, and medicine. Preparation for careers 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 the junior year attention is focused on basic engineering courses, particularly thermodynamics, fluid mechanics, and energy transfer. In the senior year these fundamentals are drawn together and applied in a study of mass transfer phenomena and processes, process design, and process dynamics. The program is strengthened and broadened with introductory courses in the electrical and mechanical sciences.

TECHNICAL ELECTIVES AND AREAS OF SPECIALIZATION

The curriculum includes 22 units of technical electives, which allows you to strengthen specific areas in Chemical Engineering, to explore new areas, or pursue areas of specialization. You are free to choose your own technical electives, but for those pursuing a normal Chemical Engineering program, Chemistry 111A and 128C are especially recommended and selections from the following list should be considered for the remaining units: Applied Science 115; Chemical Engineering 159; and Mathematics 118A, 118B, 120; and Statistics 130A, 130B. The most popular areas of specialization, together with lists of suggested technical electives, are identified and discussed in the following paragraphs.

The *premedical* and *prebiomedical engineering* areas of specialization have been specifically designed so that you may prepare for graduate work in biomedical engineering or meet the undergraduate requirements for entrance into medical school. Because of the emphasis on the natural sciences and their application to fluid mechanics, mass transport, heat transfer, thermodynamics, reaction kinetics, and process dynamics, you are well-prepared to understand similar problems in living systems. Many biological phenomena such as blood flow, passive solute transport, and energy exchange can be dealt with using the theoretical tools learned as an undergraduate.

Applied Chemistry: The Chemical Engineering curriculum includes an important core of chemistry courses. Students 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 111A, 121, 124, 128C, 129B, 129C, 130, 131, 150

Applied Mathematics: The mathematics specialization is designed both to strengthen the student's understanding of the foundations of engineering science and to improve the 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 115
Chemical Engineering 159
Engineering 180
Mathematics 118A, 118B, 119, 120, 127A, 127B, 127C, 128A, 128B, 128C, 132A, 132B, 185A, 185B
Statistics 130A, 130B

Biochemical Engineering: This area of specialization prepares students to do graduate work in enzyme engineering or biochemical engineering and for employment in the fermentation, drug, and food industries.

Suggested technical electives:

Bacteriology 2, 102
Biochemistry 101A, 101B, 101L, 123, 123L
Food Science and Technology 106

Energy Engineering: This area of specialization is designed to introduce you to the various energy sources and energy conversion methods.

Suggested technical electives:

Engineering 111, 160, 162
Agricultural Engineering 112
Mechanical Engineering 161, 162, 163

Environment Engineering: The environment engineering area of specialization prepares the student to deal with problems of environmental quality by developing knowledge of fundamental chemical and transport phenomena, that is, 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, along with other courses involved specifically with environmental topics, prepares the student to seek employment with industry or government. For this specialization six courses should be selected from the following list:

Suggested technical electives:

(Air Environment)
Atmospheric Science 121A, 121B, 123, 125

Civil Engineering 149, 242, 244
Environmental Toxicology 131
(Water Environment)
Bacteriology 2
Biochemistry and Biophysics 101A, 101B
Civil Engineering 147, 148A, 240, 243A, 243B, 246A, 246B
Water Science 41

Food Process Engineering: This area of specialization prepares students to do graduate work in food science and technology and to work in the food processing industry.

Suggested technical electives:

Bacteriology 2
Biochemistry and Biophysics 123
Food Science and Technology 104, 104L, 111, 119AT, 131, 150, 150L

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 provide space for Biological Sciences 1.

Suggested technical electives:

Four to six courses from Anatomy 100; Biochemistry and Biophysics 101A, 101B; Biological Sciences 1; Physiological Sciences 101A, 101B; Physiology 111A, 111B, 112, 113.

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. Those electing the premedical (including preveterinary) area of specialization should verify the specific preparation requirements with a pre-med adviser before making a final decision on electives. In order to insure that room is provided in your program for the biology courses, it is important to prepare a course schedule (with a Chemical Engineering adviser) as early in your freshman year as possible.

Suggested technical electives:

Chemistry 128C
Three to five biology or biochemistry courses such as Biochemistry and Biophysics 101A, 101B; Biological Sciences 1; Genetics 100A, 115; Physiology 112, 113, 114; Zoology 2-2L, 100

Civil Engineering

Civil engineering is devoted to the improvement of the human environment for the purposes of making our activities productive, safe, and enjoyable, and providing aesthetically pleasing surroundings. 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; freedom from disease-carrying wastes; land-, water-, and air-transportation; housing and other structures; flood control; and large recreational facilities.

Areas of specialization within civil engineering include (1) Civil Engineering Planning, (2) Environment 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, civil engineering majors are encouraged to include courses such as Economics 125A and 125B; Environmental Studies 145, 160, and 166; Political Science 108, 109, and 186; and Sociology 143 among their technical electives. Other technical electives of possible interest to majors in all five of the areas of specialization include Applied Science 115, Engineering 160 and 180. 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 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 courses in the humanities and social sciences.

Suggested technical electives:

Agricultural Economics 147, 148, 176
Civil Engineering 137, 143, 146, 152, 153, 160, 161, 162
Economics 125A, 125B, 130, 131
Engineering 106, 118
Environmental Studies 145, 160, 161, 166, 168A, 168B, 172
Geography 106, 155, 162
Geology 134
Statistics 130A, 130B
Political Science 181
Water Science 150

Environment Engineering: Specialization in this area is 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 based on a firm basic science and civil engineering foundation and emphasizes the design of waterborne, solid, and airborne waste management systems; the design of potable water-supply systems; and environment monitoring.

Suggested technical electives:

Applied Science 115
Atmospheric Science 120, 121A, 121B, 123, 125
Bacteriology 102, 130A
Biochemistry and Biophysics 101A, 101B
Chemical Engineering 154A, 154B, 156A, 156B
Chemistry 8A, 107A, 107B, 110A
Civil Engineering 143, 145, 146, 147, 148B, 149, 152
Engineering 118, 160
Environmental Studies 150A, 150B, 150C, 151, 162, 166
Statistics 130A, 130B

Structural Engineering, Structural Mechanics, and Geotechnical Engineering: This area is concerned with the conception, design, analysis, economics, and construction of man-made structures such as buildings, bridges, highways, and dams. The principles of structural engineering are applicable to all types of structures and all sources of loadings. Structural mechanics emphasizes the more analytical aspects of structural engineering. Geotechnical engineering emphasizes the application of the principles of soil mechanics to the design or prediction of performance of foundation and earth structures.

Suggested technical electives:

Applied Science 115
Art 121A, 121B, 121C
Civil Engineering 131B, 132A, 132C, 134, 135, 137, 138, 139, 162, 173, 175, 177
Engineering 104C, 122, 148, 180
Mathematics 128A, 128B, 128C

Transportation Planning and Engineering: Specialization in this area is 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. You are urged to acquire an awareness of the social sciences and environmental sciences through courses in these areas.

Suggested technical electives:

Agricultural Economics 148
Civil Engineering 137, 149, 152, 153, 160, 161, 162
Engineering 118, 160
Environmental Studies 168A, 168B, 172, 173, 179

Water Resources Engineering: This area includes hydraulics, irrigation and drainage, and water resources systems design. Hydraulics is concerned with flow in pipe and open-channel water-distribution systems and through hydraulic structures. Water resources systems 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 Engineering 143, 144, 145, 146, 148B, 152, 153
- Electrical and Computer Engineering 112, 150, 151
- Environmental Studies 128, 150A, 151
- Geography 162
- Political Science 172
- Water Science 103, 110A, 150, 160

Electrical and Computer Engineering

Present-day Electrical and Computer Engineering embraces a broad spectrum of disciplines based on the physical and mathematical sciences. Electrical and Computer Engineering encompasses diverse fields such as automation and control, instrumentation, communications, information processing, micro-miniaturization of integrated circuits, and solid-state electronic devices. Work in these fields is being applied in a variety of industries, communications including transportation, medicine, education, and business.

The Department of Electrical and Computer Engineering offers four broad major programs: (1) General Electrical and Computer Engineering, (2) Electrical and Computer Engineering with emphasis on Computers, (3) Electrical and Computer Engineering with emphasis on Electronics, Circuits and Signal Processing, and (4) Electrical and Computer Engineering with emphasis on Solid-State Microwaves and Quantum Electronics. All four curricula share the same core of required courses in the fundamentals of Electrical and Computer Engineering. The General curriculum provides maximum flexibility for students who want to design their own package of upper-division technical elective courses. For example, a student can plan a program that provides depth in one or more areas of specialization, or as an alternative, a program that provides breadth in the overall field of Electrical and Computer Engineering.

Curricula (2), (3), and (4) above are designed to guide students who specifically want emphasis in one of these three general areas. However, students who elect one from these three curricula still have considerable flexibility in the choice of upper-division technical electives. As in the General Electrical and Computer Engineering curriculum, this flexibility can be used to obtain either depth in these areas of specialization or breadth.

All four curricula enable students to prepare for careers as practicing engineers or for graduate study in Electrical and Computer Engineering (or both). Close correlation between theory and practice is emphasized in each curriculum, each requires a total of 180 units of credit, and each is described more fully below. The name of the particular curriculum selected will appear on the Student Record (academic transcript).

Electrical and Computer Engineering (General): All upper-division, required courses for the General Elec-

trical and Computer Engineering curriculum are listed on page 182. These requirements include a core of eight courses:

- Engineering 100;
- Electrical and Computer Engineering 110, 111, 112, 130A-130B, 140 and 170;

and 30 units of technical electives to be chosen by the student, subject to two constraints:

- at least three units must be from an upper-division Electrical and Computer Engineering course with a laboratory (excluding Engineering 100 and Electrical and Computer Engineering 111), and
- at least 12 units must be from courses included in the group of Design technical elective courses listed in the upper-division major requirements.

The core of eight courses, which is common to all four curricula, provides a foundation in electromagnetics, physical electronics, electrical and electronic circuits, and computer structure and language.

A suggested group of technical electives that would provide maximum breadth of exposure to the overall field of electrical and computer engineering is:

- Engineering 118
- Electrical and Computer Engineering 114A, 114B, 131A, 132A, 145A, 151, 157A, 160, 171, 180.

Electrical and Computer Engineering (Computers):

All upper-division required courses in Electrical and Computer Engineering curriculum, with emphasis on Computers, are listed on page 182. These requirements include the common core of eight courses described under the General Electrical and Computer Engineering curriculum above; computer courses (Electrical and Computer Engineering 170, 171, 180 and three courses to be chosen by the student from the group of computer design elective courses specified on page 182); 12 units of technical electives; and a 3-unit laboratory course selected from the group of laboratory electives. The specialization courses treat the theory, design, and application of computing systems, and include a variety of areas of sub-specialization such as computer organization, digital systems design, software systems, automata theory, formal languages, and artificial intelligence.

Electrical and Computer Engineering (Electronics, Circuits and Signal Processing):

All upper-division required courses in the Electrical and Computer Engineering curriculum, with emphasis on Electronics, Circuits and Signal Processing, are listed on page 182. These requirements include the common core of eight courses described under the General Electrical and Computer Engineering curriculum; five specialization courses (Electrical and Computer Engineering 151, 160 and three courses to be chosen by the student from the group of design technical elective courses specified on page 182); 15 units of additional technical electives; and a 3-unit laboratory course selected from the group of laboratory electives. The specialization courses treat the theory, design, and application of

electronics, circuits, and signal processing systems. They include a variety of areas of sub-specialization, such as analog waveform, circuits and systems, sampled data, digital circuits, and systems including solid-state and integrated circuits; control systems, automation, and instrumentation; and communications systems, data transmission, and information processing.

Electrical and Computer Engineering (Solid-State, Microwaves and Quantum Electronics): All upper-division required courses in the Electrical and Computer Engineering curriculum, with emphasis on Solid-State, Microwaves and Quantum Electronics, are listed on page 182. These requirements include the common core of eight courses described under the General Electrical Engineering curriculum; six specialization courses (Electrical and Computer Engineering 131A, 145A, and four courses to be chosen by the student from the group of design elective courses; see page 183); 12 units of additional technical electives; and a 3-unit laboratory course selected from the group of laboratory electives. The specialization courses treat the theory, design and application of solid-state, microwave and quantum electronic devices and systems, including integrated circuit devices, magnetic devices, lasers and superconductivity.

Materials Science and Engineering

Materials Engineering is directed towards an understanding of the structure, properties, and behavior of materials.

Modern 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.

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.

The undergraduate program in materials science and engineering provides you with the background for activities in research, processing, and the design of materials. The services of materials engineers are required 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.

The Materials Science and Engineering curriculum is based on a common core of courses that is basic to engineering. These courses, taken during your first two years, provide you with a strong foundation in fundamental engineering concepts. Your third and fourth years are primarily devoted to studying subjects in the materials sciences.

Technical electives, selected from various other engineering, physical, and natural science disciplines, give some degree of specialization at the bachelor's degree level. They also prepare you for research in a selected area at the graduate level.

AREAS OF SPECIALIZATION

Twenty-nine 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 electives, you may orient the program to suit your interests and career objectives. Examples include production and development, applied research, basic research, teaching, and management.

Upper-division courses in engineering, chemistry, physics, mathematics, and biological sciences are generally acceptable as technical electives.

The following technical elective courses and the suggested areas of specialization are guidelines to assist you and your adviser in the preparation of study lists. You may elect to take courses from a number of these areas of specialization, or you may wish to concentrate on one or two areas.

Suggested technical electives:

Automatic Control and Systems Analysis:

Mechanical Engineering 155, 171, 172
Electrical and Computer Engineering 150, 157A,
157B
Engineering 118

Biomedical Engineering:

Chemistry 107A, 107B
Biological Sciences 1
Engineering 134
Zoology 2
Physiology 111A, 111B, 112, 113
Physical Education 101, 102

Chemical Corrosion:

Chemistry 110A, 110B, 110C or 107A, 107B
Chemical Engineering 151, 152A, 152B
Engineering 134

Computers:

Applied Science 115
Electrical and Computer Engineering 171, 172, 175,
176, 177, 180, 181, 182
Mathematics 128A, 128B, 129A, 129B, 168
Statistics 130A, 130B

Electronic Materials:

Electrical and Computer Engineering 130A, 130B,
140, 145A, 145B, 145C, 148

Physics 121
Geology 180

Environmental Engineering:

Engineering 134, 160
Atmospheric Science 120, 123, 125
Biochemistry and Biophysics 101A, 101B
Water Science 41
Chemistry 8A, 8B
Civil Engineering 149

Heat Transfer:

Engineering 105B
Mechanical Engineering 165
Chemical Engineering 150A, 153

Materials Design and Processing:

Engineering 104B, 104C, 106, 134
Mechanical Engineering 150A, 150B, 151, 152, 155
Civil Engineering 137

Physics of Solids:

Physics 115A, 115B, 140A, 140B
Electrical and Computer Engineering 145A, 145B,
145C, 148
Engineering 145
Geology 180

Suggested advisers:

D.G. Howitt, A.K. Mukherjee, Z.A. Munir, J.F.
Shackelford.

Mechanical Engineering

The modern mechanical engineer uses basic science in the design and manufacture of complex engineering systems. This requires the application of physical and mechanical principles in the development of machines, energy conversion systems, materials, and equipment for guidance and control.

Preparation for 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. The third year is spent 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, and materials science. You can prepare either for graduate study in Mechanical Engineering or obtain a broad background for entering engineering practice at the bachelor's level.

A broad range of technical elective courses is available. Students are encouraged to select these courses from among the areas of specialization listed below.

AREAS OF SPECIALIZATION

Creative Design: The creation and improvement of products, processes, or systems which are mechanical in nature are the primary goals of a professional mechanical engineer. This is a challenge now more than ever, because the solutions to such major social concerns as environmental pollution, mass transportation, raw material shortages, and energy concerns 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 organize and solve a variety of problems. In addition to having technical competence, the designer must be able to consider the socioeconomic consequences of the design and its possible impact on the environment. Product safety, reliability, and economics are other considerations.

Suggested technical electives:

Mechanical Engineering 124, 128A, 128B, 150B,
151, 152, 155, 162, 163, 172
Applied Science 115
Civil Engineering 131A, 132A
Agricultural Engineering 118, 119, 133, 134
Engineering 104C, 111, 118, 122, 140, 142, 160

Suggested advisers:

C. W. Beadle, J. M. Henderson, M. L. Hull, A. T.
Yang

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. It is in these fields that 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 such diverse topics as combustion engines, gas turbines, heat exchangers, nuclear reactors, MHD power generators, solar energy systems, and others.

Suggested technical electives:

Engineering 160
Mechanical Engineering 110, 161, 162, 163, 165

Suggested advisers:

J. W. Baughn, H. Brandt, H. A. Dwyer, W. H. Giedt,
M. A. Hoffman, B. E. Launder, A. A. McKillop

Systems Dynamics and Control: Modern 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 is 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 equally well to social, economic, and other dynamic systems.

Suggested technical electives:

Mechanical Engineering 124, 134, 152, 172
Electrical and Computer Engineering 112, 151
Engineering 122, 140, 160

Suggested Advisers:

J. W. Brewer, M. Hubbard, D. C. Karnopp, D. L. Margolis

Transportation Systems: An important aspect of Mechanical Engineering has traditionally involved 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. This 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:

Engineering 122, 160
Mechanical Engineering 124, 127, 128A, 128B, 134, 152, 161, 162, 172
Civil Engineering 131A, 149, 160

Suggested advisers:

M. Hubbard, D. C. Karnopp, D. L. Margolis

GRADUATE STUDY IN ENGINEERING

The following departments offer courses of study leading to both the Master of Science and Doctor of Philosophy degrees. Programs in these departments are particularly appropriate for those wishing to prepare for careers in teaching, research, or analytical design.

- Agricultural Engineering
- Applied Science (Davis-Livermore)
- Chemical Engineering
- Civil Engineering
- Electrical and Computer Engineering
- Mechanical Engineering

Professional programs emphasizing design and leading to the Master of Engineering and Doctor of Engineering degrees are offered by the following departments:

- Agricultural Engineering
- Civil Engineering

- Electrical and Computer Engineering (Doctor of Engineering degree *only*)
- Mechanical Engineering

Graduate students in engineering are permitted wide latitude in selecting courses and research or design subjects at both the master's and doctoral levels. A purposeful and well-integrated course of study is planned with the help of an adviser or guidance committee.

More general information may be found in the *Announcement of the Graduate Division*, obtainable from the Dean of the Graduate Division. Detailed information on graduate study in engineering is contained in the *College of Engineering Bulletin*, available from the College Undergraduate Office.

Off-Campus Learning

Many courses in engineering are available on the campus television network at receiving sites in Livermore, Sacramento, Marysville-Yuba City, and the Diablo Valley. Those interested in TV classes should contact the Engineering Departments at addresses listed in the courses section.

Graduate Certificate Program

For engineers who already have a degree, the College of Engineering offers a Graduate Certificate Program. This program consists of course work 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 units from courses not specifically required of UC Davis undergraduate engineering majors
- At least 9 of these 15 units must be from formal graduate courses
- Graduate Division acceptance

Further information on the Graduate Certificate Program may be found in the *College of Engineering Bulletin*.



College of Letters and Science

Information:
Dean's Office
150 Mrak Hall
752-0392

The College of Letters and Science offers programs of study that expose a student to the worlds of human experience, of ideas, of artistic accomplishments, and of matter and things. These four worlds are the domains of the social sciences, the humanities, the fine arts, and the natural sciences, respectively. Although separate and distinct to the casual observer, these areas are interconnected and may be studied in a coherent curriculum. It is within this curriculum that you will be able to explore a variety of academic fields, engage in the pursuit of fundamental knowledge primarily for its own sake, and gain the capacity for independent study and thought.

A well-balanced liberal education, including in-depth study of a major field, should prepare you for a satisfying life, whatever your career. And since more and more career opportunities depend on the completion of a basic letters and science curriculum, such an education will also have a vocational value.

The main emphasis in the College remains, however, on the ends of living rather than on the means. Undergraduate education in the College stresses breadth rather than specialization.

Within the specific standards of scholarship and unit distribution that the College has established for its programs of study, there are three groups of requirements crucial to the realization of the College's educational goals: the English Composition Requirement, the Breadth Requirements, and the Major Requirements.

The **English Composition Requirement** is designed to insure that you are well-versed in the skills of written communication.

The **Breadth Requirements** provide you with a broad background of knowledge, help you to explore the interdependencies of knowledge, and acquaint you with other cultures.

The **Major Requirements** enable you to gain intellectual depth and competence in a selected area of study.

Bachelor of Arts (A.B.) and Bachelor of Science (B.S.) degrees are offered by the College. These degrees are conferred upon your completion of the University's requirements and the College's general education and major requirements detailed on the following pages.

Every student is personally responsible for seeing that these graduation requirements are met. (Changes in graduation requirements, other than those in the major, adopted after publication of the General Catalog, are posted on the Letters and Science bulletin board opposite Room 175, Mrak Hall.)

STUDENT SERVICES

Information:
Dean's Office
150 Mrak Hall
752-0392

The primary function of the Dean's Office is to assist students with questions concerning academic matters and program planning. The deans and academic counselors staff an advising service designed especially to assist undeclared students with selecting a study program and in their search for a major. All students are welcome, however, to come in for general academic advising.

This office can also help you with questions concerning College requirements, scholarship (probation and disqualification), and other academic matters. Problems which cannot be resolved by staff assistants are referred to academic deans or counselors who are regularly available to students by appointment.

The Dean's Office also performs a number of regular functions:

- Maintains a file of your academic record

An education which emphasizes job skills may prepare you for the quarter of your waking life spent at work, but a liberal arts education prepares you for all of life.
— Dean, Letters and Science

- Determines how your transfer credits from other institutions apply towards completion of breadth and unit requirements for the bachelor's degree
- Sends you a Status Card outlining transfer credit information
- Prepares a statement of remaining College requirements, on request, for seniors (Senior Degree Check, page 97)
- Acts on petitions requiring the Dean's approval, e.g., petitions for declaration or change of major; change of study list after established deadlines; waiver of minimal progress requirements; permission to take 200, 300, and 400-numbered courses for degree credit; withdrawal; reentry on probation or after completion of 120 units
- Reviews the records of students who are subject to disqualification and recommends dismissal from the College or continuation on probation

ADVISING

Faculty Advising

Good advising means the difference between an exciting and an indifferent educational experience. Given the range of programs and courses offered within the College of Letters and Science, good advice is essential if students are to design an educational program that will best fit their needs and individual goals.

In the College of Letters and Science, the relationship between student and faculty adviser is largely a voluntary bond. Thus, the effectiveness of advising depends both on the perceptiveness of the adviser and the initiative of the student.

An adviser can assist you not only in meeting minimal degree requirements, but also in taking maximum advantage of the resources available in the University. You are encouraged to talk to faculty advisers in different fields to enable you to make educational decisions on the basis of the broadest possible body of information and ideas. Although degree requirements may appear many and complex, they leave substantial room for individualization of study programs. With the help of faculty advisers, you can keep open as many options as possible while still progressing toward your major degree objectives.

Remember, it is your responsibility to maintain regular contact with your faculty adviser. A good relationship is developed by meeting frequently and discussing honestly and thoughtfully your problems and expectations. A conference at least once a quarter is especially desirable for new students during their first year in the College and for seniors during the final quarters preceding graduation.

Feel free to come to the Dean's Office for consultation on any academic matter.

New students are assigned to an adviser when the University receives their Statement of Intention to Reg-

ister. If you indicated an interest in a particular program on your application for admission, your adviser will be a faculty member associated with that major. If you change your major, you will be reassigned.

If your faculty adviser happens to be unavailable at a critical time, you should ask the department or program administering your major for an alternate adviser to assist you temporarily. Department and program offices are listed in the *Class Schedule and Room Directory*.

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

If you participate in the Summer Advising and Registration Conference, you will be assisted in planning your Fall Quarter program by a temporarily assigned summer faculty adviser. You must contact the regular adviser you have been assigned during Orientation Week of the Fall Quarter.

Continuing students who have completed three quarters in residence in the College are no longer obligated to consult an adviser; they are urged, however, to maintain regular contact with an adviser in their major to avoid program errors which may delay graduation.

Undeclared students who are as yet uncertain of their goals, and especially students lacking a clearly identifiable interest, are urged to make an appointment with one of the deans or academic counselors in the College Academic Advising Office (150 Mrak Hall).

Seniors should maintain close contact with their adviser in order to insure that they are meeting the major requirements.

Peer Advising

Student-to-student advising is an important part of the University advising services. Refer to the index under "Advising" for information on the various peer advising programs.

Preprofessional Advising

The College of Letters and Science does not offer special preprofessional programs. Students who plan to prepare for a professional school undertake a normal program leading to an A.B. or B.S. degree. Most courses required by a professional school are included in the requirements for the bachelor's degree, and additional courses you need may be taken as electives. You should become aware of the requirements for prospective professional schools early in your career in order to plan a suitable program. You may obtain further assistance from the Health Sciences Advising Office, the Pre-Law Advising Office, Pre-Business Advising Office, or the Work-Learn and Career Planning and Placement Center.

TEACHING CREDENTIAL

The teacher education program is administered by the Graduate Division. See page 105 for more complete information.

I expected the advisers to tell me more about what I should take, but I soon realized that it's my future and I should do what I want.
—Freshman, Political Science

THE MAJOR

There are three types of programs which satisfy requirements for the major: departmental majors, interdepartmental majors, and individual majors.

Major Programs Offered by the College of Letters and Science

Following is a list of the major programs offered by the College of Letters and Science. All but three of the majors lead to a Bachelor of Arts degree. Those which lead to a Bachelor of Science degree are indicated by a footnote symbol (see below). Courses listed in the Catalog under Astronomy, Chinese, Classics, Education, Integrated Studies, Japanese, Oriental Languages and Civilization, Portuguese, Scandinavian, and Swedish are taught by teaching departments or programs in the College of Letters and Science, but *no undergraduate majors* with these names exist.

Afro-American Studies
 American Studies
 Anthropology¹
 Applied Physics²
 Art History
 Art Studio
 Bacteriology¹
 Biochemistry²
 Biological Sciences¹
 Botany¹
 Chemistry¹
 Classical Civilization
 Comparative Literature
 Dramatic Art
 East Asian Studies
 Economics
 English
 French
 Genetics²
 Geography¹
 Geology¹
 German
 Greek
 History
 International Relations
 Italian
 Latin
 Linguistics
 Mass Communication
 Mathematics¹
 Medieval Studies
 Mexican-American (Chicano) Studies
 Music
 Philosophy
 Physical Education
 Physics¹
 Physiology²
 Political Science
 Political Science: Public Service
 Psychology¹
 Religious Studies
 Rhetoric
 Russian
 Russian Literature and History
 Sociology
 Spanish
 Statistics¹
 Zoology¹

Declaration of Major

Students who have not declared a major must do so by the time 100 units have been completed. If you fail to declare a major, a hold will be placed on your further registration. It will be removed only when your *Petition for Declaration or Change of Major* is on file in the Dean's Office. Petitions can be obtained from faculty advisers or the offices administering the respective major programs. Office locations are printed in the *Class Schedule and Room Directory*. As a part of the petitioning procedure, you must, in consultation with an adviser, prepare a projected plan of study. You are accepted into the major only after your adviser and the Dean have signed, approved, and endorsed the petition. The department or curriculum committee supervising the major program will assign you to a faculty adviser.

Individual Majors

The individual major is a program organized by a student in consultation with faculty advisers who are expert in the requisite fields of interest. If you wish to undertake an individual major, request the appropriate forms, which include detailed instructions, from the Dean's Office, 150 Mrak Hall. Program requirements are outlined on page 231.

Multiple Majors

If you are interested in two or more areas of study, you should consider the possibility of pursuing your goals by completing one or more of the optional minors offered by the College along with your major. This is usually the best approach from an educational point of view and offers maximum flexibility in planning your program of courses. The alternative, and most common type of multiple major, is the double major which leaves considerably less freedom of choice.

After endorsement of the major petitions by the appropriate faculty advisers, the Dean may approve declaration of more than one major, if there are significant differences between the disciplines and the requirements of the major programs involved. In addition, approval is subject to the following conditions:

1. Overlap between the two majors involved in a request may not normally exceed 8 upper-division units.
2. It must be possible to complete all degree requirements within the 195-unit limit on registration (see page 97).
3. At the time of request, a substantial part of the preparatory subject matter for both majors must have been successfully completed.

Requests for multiple majors must be based on sound academic and educational considerations. Frequently, when a major (whether departmental, interdepartmental, or individual) is supplemented with a carefully selected program of courses or a minor that supports and amplifies your special interest, your educational goals are better served than when two or more major programs are studied in their entirety.

Just because you major in history doesn't mean you'll be a historian for the next 40 years of your life. There are music majors in Med School and Art History majors working for IBM. A major is something you enjoy and feel is valuable.
 — Senior,
 Mathematics

¹Offers a program leading to the Bachelor of Science degree as well as a program leading to the Bachelor of Arts degree.

²Offers the Bachelor of Science degree only.

Certain combinations of majors cannot be approved. Please see the Dean's Office for current information on prohibitions.

Cross-College Major

You may simultaneously pursue major programs in two undergraduate colleges on the Davis campus. The same conditions and criteria apply as for multiple majors (see above). The requirement for a substantial and significant difference between the disciplines involved is enforced strictly in the case of proposals for cross-college majors. In addition, 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 Bacteriology, Biochemistry, Biological Sciences, Botany, Genetics, Physiology, or Zoology.

Change of Major Within the College

You may change from one major to another within the College with the Dean's approval. Consent of the department or committee in charge of your proposed new major is also required. Admission into a major program may be denied if your grade-point average in courses required for the selected major is less than 2.000.

Procedures for change of major within the College are the same as for declaration of major (see page 91), and the same conditions apply.

Except under unusual circumstances, no change of major will be permitted after you attain senior standing (135 units).

Change of Major Accompanied by Change of College

In order to change from one college to another, you must be in good standing (not on probation or subject to disqualification).

If you are in good academic standing and want to transfer into the College of Letters and Science, you must petition to do so within the first five weeks of the quarter. Petitions, which are available at the Registrar's Office and the Dean's Office, must be endorsed by your new faculty adviser and signed by your former College Dean before being submitted to the Letters and Science Dean for consideration and approval.

A 2.000 grade-point average in the courses required for the new major is usually necessary at the time of transfer. Requests for changes of major from students in senior standing may be approved only under unusual circumstances.

Grade-Point Averages in the Major

In addition to the general University requirement of a C average (2.000) for all University work, the College stipulates the following additional criteria:

You must have an average of at least 2.000 for all UCD courses required for the major; you must also have at least a 2.000 average for all upper division courses required for the major. To obtain these minimal aver-

ages in the major, you may, *with approval of your adviser*, repeat courses that were graded D or F. If you have to repeat a course more than once, you need the Dean's approval.

A department or curriculum committee may refuse to accept you into a major they administer if you do not have at least a 2.000 average in the courses required for the major.

If your performance is unsatisfactory (less than 2.000) 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.

THE MINOR

Departments and teaching programs may offer *optional* minors to students in the College of Letters and Science. Completion of a minor is not required for a degree, but you may elect to satisfy the requirements of one or more minors and have completion of the minor(s) certified on your transcript. Most departments and programs that offer a minor list course requirements in the Majors and Courses section of this catalog. Following is a list of teaching departments and programs which offer minor programs:

American Studies
Anthropology (Biological Anthropology, Social-Cultural Anthropology)
Art (Art History, Art Studio)
Biological Sciences
Botany
Classics (Greek, Latin)
Comparative Literature
Dramatic Art
East Asian Studies
Education
English
French
Geography
Geology (Geology, Economic Geology, Engineering Geology, Environmental Geology, Geochemistry, Geomorphology, Geophysics, Oceanography, Paleobiology)
German (German Language, German Literature)
History
Italian
Linguistics
Mathematics
Mexican-American (Chicano) Studies
Music
Oriental Languages and Civilizations (by arrangement)
Philosophy
Physics (Classical Physics, Quantum Physics, General Physics)
Political Science
Psychology
Religious Studies (Religious Studies, Oriental Religions, Judaism, Christian Studies)
Rhetoric
Russian (Russian Language, Russian Literature)
Russian History and Literature
Sociology (Sociology, Sociology — Social Welfare, Sociology — Law and Society)
Spanish
Statistics



Certification of a minor on the transcript indicates that you have completed a coherent program of courses in an area of interest outside your major. The minor may complement your major, but it is not particularly meaningful unless the field of study is significantly different from that of your major.

A minor consists of 18 to 24 units in upper-division courses specified by the department or program. 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 2.000 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.

Some departments and programs do not offer a minor, while others may offer several. You can elect only one minor in a subject area. If the department or program you are interested in does not list a minor in this catalog, check with that department or program office.

If you want to have completion of a minor certified on your transcript, you must file a request with the Letters and Science Dean's Office in the quarter preceding graduation. Thus, June graduates have to file during the Winter Quarter. The minor does not have to be completed when you file your request, but requirements must be satisfied at the time of graduation. The Dean's Office has forms available for this purpose. The specific deadlines will be announced.

REQUIREMENTS FOR THE BACHELOR'S DEGREE

University Requirements

University requirements for the bachelor's degree are described beginning on page 60.

College Requirements

Unit Requirements. A minimum of 180 units is required for the degree (see page 95 for restrictions on credits that may be counted toward the 180 units). Of these units, 64 must be upper-division units which include 48 units from Letters and Science teaching departments and programs.

English Composition Requirement. The English Composition requirement can be met in one of two ways:

1. by passing the English Composition Examination (see page 96) upon completion of 70 units of degree credit; **OR**
2. by completing with a grade of C- (or P) or better
 - a. one course in English composition from English 1, 2, 3, 20, Comparative Literature 1, 2, or 3; **AND**

- b. English 103 (which must be taken after 84 units have been completed).

Breadth Requirements. The two requirements that comprise the breadth requirements are:

1. **Foreign Language requirement**

A.B. degree: the 12-unit level or the equivalent in one language (see page 96 for details).

B.S. Degree: none.

2. **Area requirements**

A.B. degree: A total of 52 units in social sciences, humanities and fine arts, and natural sciences/mathematics with a minimum of 12 units in each area. A maximum of 20 units may be counted toward any one area. An additional 12 units of upper-division courses offered by Letters and Science teaching units other than the major department or program.

B.S. degree: A total of 90 units in natural sciences/mathematics; and a total of 20 units in social sciences and/or humanities and fine arts.

(All of the courses used to satisfy this requirement must be chosen from those on the Area Requirement List shown on page 94.)

Major Program Requirements. Requirements for major programs are described in the Majors and Courses section of this catalog, beginning on page 131. These requirements are fulfilled by completing a major program offered by a teaching department or curriculum committee in the College of Letters and Science (see page 91).

Scholarship Requirements. For all UCD courses required for the major program, the minimum grade-point average is 2.000. For all upper division UCD courses required for the major program, the minimum grade-point average is 2.000. See page 60 for University requirements.

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. For University requirements, see page 62. (Work completed while enrolled in the Education Abroad Program does not satisfy campus or College residence requirements.)

Area Requirement List

Courses numbered 48, 92, 97T, 97TC, 98, 192, 197T, 197TC, 198, and from 200 through 499 cannot be counted toward satisfaction of the area requirements. A maximum of 10 units in special study courses (99, 194H, 199) may be counted toward area requirements. Subject to the restrictions just listed, courses acceptable for fulfilling breadth requirements are classified as follows:

Humanities and Fine Arts

Afro-American Studies 10.

American Studies. A.B. degree: equally divide a maximum of 16 units between humanities/fine arts



and social sciences. B.S degree: 12 units allowed toward social sciences and humanities/fine arts.

Art.

Asian American Studies 1, 150A.

Cantonese 2, 3, 4, 5, 6.

Classics.

Comparative Literature. All courses except *first* course taken from either 1, 2, 3 (or English 1, 2, 3, 5F, 5P). All subsequent courses in Comparative Literature may be counted toward humanities/fine arts.

Dramatic Art.

English. All courses except A, 25, 26, 28, and *first* course taken from either 1, 2, 3, 5F, or 5P (or Comparative Literature 1, 2, or 3). All subsequent courses in English may be counted toward humanities/fine arts.

Foreign language. A.B. degree: all courses in foreign language departments, including literature courses, except the first 6 units of course work (course 1 or the equivalent in most languages offered on the Davis campus) in the language offered in satisfaction of Foreign Language requirement.

History.

Linguistics 1, 106, 107, 196.

Medieval Studies.

Music.

Native American Studies 32A, 32B, 33, 34A, 34B, 34C, 101, 155, 156, 157, 181A, 181B, 181C.

Philosophy.

Religious Studies.

Rhetoric.

Social Sciences

Afro-American Studies 100, 101B, 107, 110, 120, 121.

American Studies. (See "Humanities/Fine Arts" above.)

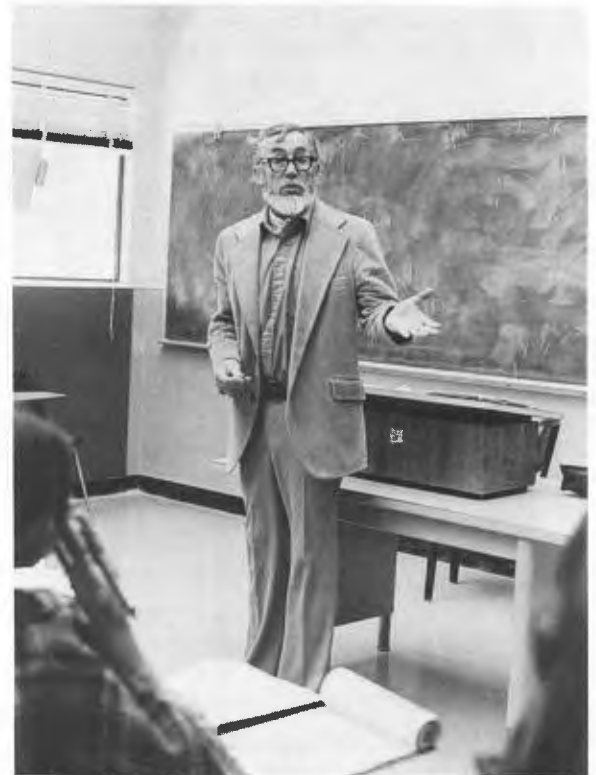
Anthropology. All courses except 1, 5, 13, 150, 151, 152, 153A, 153B, 154A, 154B, 155, 156, 195, 196.

Asian American Studies 2, 100, 110, 111, 150B.

Chicano Studies 10.

Economics. All courses except 12.

Education. All courses except 114.



Geography. All courses except 1, 3, 102, 105, 106, 107, 108, 110, 111, 112, 115, 117.

Linguistics. All courses except 1, 106, 107, 196.

Native American Studies 20, 106, 110, 112, 116, 130A, 130B, 130C, 180.

Political Science.

Psychology. All courses except 15, 41, 103, 105, 108, 129, 131, 150, 154, 165, 177, 180A, 180B, 180D, 180K.

Sociology. All courses except 46A, 46B, 106.

Natural Sciences and Mathematics

Anthropology 1, 5, 150, 151, 152, 153A, 153B, 154A, 154B, 155, 156, 157.

Astronomy.

Bacteriology. All courses except 101.

Biochemistry and Biophysics.

Biological Sciences. All courses except 12, 19.

Botany.

Chemistry.

Entomology 10, 100.

Genetics.

Geography 1, 3, 108, 110, 111, 112, 115, 117.

Geology.

Human Anatomy 101.

Mathematics.

Physical Education 101, 102, 103, 113.

Physics.

Physiology.

Psychology 15, 108, 129, 131, 150, 154, 180B, 180D, 180K.

Statistics.

Zoology.

If you are interested in a particular field go out and talk to some people in that field. You just have to stick your neck out — you'll be surprised at how often people are receptive and encouraging.
— Professor, Political Science



COLLEGE POLICIES AND PROCEDURES

Inquiries concerning the policies and procedures listed in this section should be directed to the Dean's Office, College of Letters and Science, 150 Mrak Hall. See also the section on Registration, beginning on page 53.

Credit for Courses

Advanced Placement Examinations. For credit allowed on units earned through Advanced Placement Examinations, see page 58.

Education Abroad Program. Full University credit may be awarded for courses taken through the Education Abroad Program. See page 178 for further information.

Extension Courses. Students in residence may apply credit earned in University Extension courses toward the 180-unit requirement, provided written approval has been obtained from the Dean *prior* to enrollment. 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 Senior Residence requirements of the College. No grade-points are assigned for courses completed in University Extension.

Graduate and Professional Courses You must obtain the recommendation of the instructor in charge and the department chairperson—in addition to approval from the Dean—prior to enrollment in order to receive elective credit toward the degree for the following kinds of courses:

- Graduate courses 200-298
- Professional courses for teachers 300-398 offered outside of the College of Letters and Science
- Postgraduate professional courses 400-498 offered by professional schools (Courses in this series which are offered by teaching departments

and programs in the College of Letters and Science do not require the Dean's approval.)

- All variable-unit courses in the 200, 300, and 400 series

Special-study courses in the graduate and professional series, such as courses 299, 399, and 499 do not satisfy degree requirements. Undergraduate students in the College cannot receive credit for such courses.

Before enrolling in graduate or professional courses, you must meet certain minimal conditions. You must have an overall UC grade-point average of 3.3 and 18 units of upper-division instruction in subject matter basic to the course. Exceptions may be considered if your preparation warrants.

You may count 9 units in courses numbered 200 through 298 and a combined total of 9 units in the 300 and 400 series as elective credit toward the degree. Units earned in courses in the 200, 300, and 400 series do not count as upper-division units and nonstandard courses in these series are included in the 30-unit limit on nonstandard courses.

Internship Courses. Student internships (generally courses numbered 92 and 192) are available through many Letters and Science departments. You must have completed a minimum of 84 units before credit will be allowed for an upper-division internship course.

Unit Credit Limitations. For certain courses, limits have been established for 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:

Professional courses (300 and 400 series, except 399 and 499 courses): 9 units maximum. (See Graduate and Professional Courses above.)

Extension courses: 9 units maximum by petition. (See Extension Courses above.)

Graduate courses: 9 units maximum by petition. (See Graduate and Professional Courses above.)

Internship courses (numbers 92, 192): 12 units maximum. (See Nonstandard courses below.)

Nonstandard courses (92, 97T, 97TC, 99, 192, 197T, 197TC, 199 and similar courses): 30 units maximum or $\frac{1}{6}$ of the units taken at UCD, whichever is the smaller. (Note separate unit limits on internship, special study, and tutoring courses.)

Passed/Not Passed courses: Maximum of $\frac{1}{4}$ of UCD units graded "P" taken at student's option. (Note University limitation pages 55-56.)

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.)

Repeated Courses. You may repeat a course in which you received a D, F, or NP. If the course you would like to repeat is part of a sequence (e.g., Mathematics 16A, 16B, 16C; French 1, 2, 3, 4, 6) and you have already passed a subsequent course in the sequence (e.g., you want to repeat French 2, but you have already passed French 3), you should check with the Dean's Office and the department regarding whether you can receive grade-point and/or unit credit. (See also page 57.)

Transfer Courses in English Composition. Transfer courses considered by the Dean to be equivalent or comparable to English 1, 2, 3, 20, 103A-F, or Comparative Literature 1, 2, 3 will be accepted toward satisfaction of the 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 take English 103 at Davis or fulfill the requirement by examination (see below).

ENGLISH COMPOSITION EXAMINATION

The English Composition requirement can be met with a passing score in the English Composition Examination.

This academic year, the examination will be offered on the following Saturday mornings:

November 1, 1980

January 31, 1981

April 25, 1981

You are advised to complete this requirement in your junior year. There are no examinations administered during the summer.

Sign-up rosters will be posted on the Dean's Office bulletin board, Mrak Hall foyer, Monday through Thursday of the week prior to each examination date. (Students in the College of Engineering may sign up in 2132 Bainer Hall.)

The Letters and Science English Composition Examination Form, available at the UCSD Bookstore, is required.

FOREIGN LANGUAGE REQUIREMENT (A.B. degree)

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.

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. The Foreign Language Requirement should be completed 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 (junior year abroad).

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.

If you are a transfer student, 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. Consult your *Status Card*, which is issued by the Dean's Office prior to admission to the College.

2. *CEEB Achievement Test.* Earning a qualifying score of at least 500 on a College Entrance Examination Board (CEEB) 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 you should petition for satisfaction of the Foreign Language Requirement at the Letters and Science Dean's Office.

3. *CEEB Advanced Placement Examination.* A score of 5, 4, or 3 on any foreign language College Entrance Examination Board (CEEB) Advanced Placement Examination taken in high school will satisfy the Foreign Language requirement.

4. *Course Completion in College (or the equivalent).* A.B. degree: 12-unit level in one language (e.g., Spanish 2 or Latin 3). B.S. degree: as required in the major program.

If you have successfully completed the second or third year of a language in the 10th or higher grade in high school you may receive unit credit for course 1 of that language on a P/NP grading basis only.

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.

PASSED/NOT PASSED GRADING

Filing Procedures

Passed/Not Passed petitions are available for students in good academic standing in the Dean's Office, 150 Mrak Hall, on the dates listed in the *Class Schedule and Room Directory*, and must be filed in person.

No signature other than yours is required on the petition. For detailed information, see page 55.

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.

Limitation on Credit for Units Graded P

Excluding courses which 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 at UCD.

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 (see page 56).

REGISTRATION BEYOND THE 195-UNIT LIMIT

A minimum of 180 units is required for the bachelor's degree, and you are expected to fulfill all degree requirements within the 180- to 195- unit range. Once 195 units have been completed, you may register only with the permission of the Dean. Permission will be granted for sound educational reasons and for a limited time only. You will be expected to adhere to the specific program of courses agreed upon and to meet other conditions that may have been set. Approval must be obtained before course enrollment materials can be made available to you for the quarter following completion of 195 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 195 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 LIMITATIONS

Ordinarily, a full-time student is expected to take an average of no fewer than 12 units a quarter. (Note the Minimal Progress Requirements on page 59.)

Students in their freshman 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 make-up work to remove incomplete grades is not included.

SENIOR DEGREE CHECK

During the final quarter of your junior year, or no later than the first quarter of your senior year, you should request a *Degree Check* from the Dean's Office. A statement indicating any unfulfilled University and College degree requirements will be sent to you. To insure receipt of this statement before the beginning of the succeeding term, you must file the request during the first five weeks of a quarter. Information about your progress toward completing requirements in the *major* should be obtained by conferring with a faculty adviser for your major program.

HONORS

The Dean's Honors List

In order to be placed on the Dean's Honors List at the end of a regular quarter, you must satisfy two criteria:

1. Complete at least 12 units for a letter grade during that quarter;
2. Earn a grade-point average, for that quarter, that places you in the upper 16 percent of the students registered in the same class level and college.

To remain on the Honors List you must meet these same standards every quarter. This list is posted quarterly on the College bulletin board in the foyer of Mrak Hall.

Honors with the Bachelor's Degree

Two categories of honors may be awarded at graduation, based on the following minimum grade-point requirements:

Total Units Completed at UC	Average of UC Work Highest Honors	
	Honors	Honors
45-89	3.5	3.9
90-134	3.4	3.8
135 and over	3.3	3.7

Recommendation from the major department, requested by the Dean's Office, is also required if you are eligible for highest honors. In some departments and programs completion of an honors program or thesis is an additional requirement for "highest honors."

You will not be awarded honors with the bachelor's degree if more than eight units of grade I (Incomplete) appear on your transcript. The College Committee on Honors may consider exceptions to this condition. Petitions for this purpose should be submitted to the Dean's Office. (See also page 63.)

University and College Medals

Graduating seniors with a distinguished academic record in the College of Letters and Science 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. Academic excellence is the primary basis for selecting the recipient of this award.

The college also nominates graduates with distinguished academic records for the University Medal.

You'll find faculty and staff members very willing to help you out, but they can only assist if you let them know you need help.
— Senior, Rhetoric

Graduate
Division



The Graduate Division

Information:
252 Mrak Hall
752-0650

The Graduate Division is the academic home of approximately 3,000 post-baccalaureate students who are seeking advanced degrees in more than 70 graduate programs on the Davis campus.

Graduate study and research are administered by the Graduate Council, a standing committee of the Davis Division of the Academic Senate, and by the Dean of the Graduate Division. A Universitywide Coordinating Committee on Graduate Affairs determines general policies and establishes common procedures.

In developing its graduate programs, the Davis campus has taken advantage of a special pattern of organization allowing great flexibility: the creation of graduate "groups" which cut across the usual lines of faculty division into departments and colleges. A "group" is a graduate faculty whose membership is determined by research interest, not by department affiliation. Groups may be organized to offer an interdisciplinary program or to augment the faculty of a department, permitting participation in that discipline by faculty members who hold appointments in other departments.

Research is, of course, an integral part of graduate education. The Office of Research in the Graduate Division has as its primary purpose the administration of extramural grants and contracts. A portion of the total function has been decentralized to the several colleges, which review research proposals with regard to their consistency with the campus academic plan and resources of the colleges. Current emphasis in research development is on broad programs relating to the environment, programs in which faculty and students from a wide spectrum of formal disciplines may participate.

ADVANCED DEGREE PROGRAMS AT DAVIS

The following advanced degrees are offered at UC Davis: Master of Administration (beginning fall 1981), Master of Arts, Master of Science, Master of Fine Arts,

Master of Arts in Teaching, Master of Engineering, Master of Health Services, Master of Education (in Agricultural Education), Master of Preventive Veterinary Medicine, Candidate in Philosophy, Doctor of Engineering, and Doctor of Philosophy. Those departments or groups offering programs for the degree of Doctor of Philosophy may, if they choose to do so, recommend the degree Candidate in Philosophy for all students formally advanced to candidacy. In addition to these graduate degrees, professional degrees are offered in the Schools of Law, Medicine, and Veterinary Medicine.

Majors for graduate study and the advanced degrees offered in each are shown below. General requirements for degrees are published in the *Announcement of the Graduate Division*. Specific requirements are available from the office of the department concerned.

Majors and Degrees

Administration (M. Admin.) — refer to Graduate School of Administration
Agricultural and Environmental Chemistry (M.S., Ph.D.)
Agricultural Economics (M.S., Ph.D.)
Agricultural Education (M.Ed.)
Agronomy (M.S.)
Anatomy (M.S., Ph.D.)
Animal Behavior (Ph.D.)
Animal Science (M.S.)
Anthropology (M.A., Ph.D.)
Art (M.F.A.)
Atmospheric Science (M.S., Ph.D.)
Avian Sciences (M.S.)
Biochemistry (M.S., Ph.D.)
Biomedical Engineering (M.S., Ph.D.)
Biophysics (M.S., Ph.D.)
Botany (M.S., Ph.D.)
Chemistry (M.S., Ph.D.)
Child Development (M.S.)
Classics (M.A.)
Clinical Psychology (Ph.D.)
Community Development (M.S.)



Comparative Literature (M.A., Ph.D.)
Comparative Pathology (M.S., Ph.D.)
Computing Science (M.S., Ph.D.)
Dramatic Art (M.A., M.F.A., Ph.D.)
Earth Sciences and Resources (M.S., Ph.D.)
Ecology (M.S., Ph.D.)
Economics (M.A., Ph.D.)
Education (M.A.)
Endocrinology (M.A., Ph.D.)
Engineering (M. Engr., M.S., D. Engr., Ph.D.)
English (M.A., Ph.D.)
Entomology (M.S., Ph.D.)
Family Nurse Practice (M.H.S.)
Food Science (M.S.)
French (M.A., Ph.D.)
Genetics (M.S., Ph.D.)
Geography (M.A., Ph.D.)
Geology (M.S., Ph.D.)
German (M.A., Ph.D.)
History (M.A., M.A.T., Ph.D.)
History of Art (M.A.)
Horticulture (M.S.)
Immunology (M.S., Ph.D.)
International Agricultural Development (M.S.)
Law (J.D.) — refer to School of Law
Linguistics (M.A.)
Mathematics (M.A., M.A.T., Ph.D.)
Medicine (M.D.) — refer to School of Medicine

Microbiology (M.A., Ph.D.)
Music (M.A., M.A.T.)
Nutrition (M.S., Ph.D.)
Pharmacology and Toxicology (M.S., Ph.D.)
Philosophy (M.A., Ph.D.)
Physical Education (M.A.)
Physics (M.A., Ph.D.)
Physiology (M.S., Ph.D.)
Plant Pathology (M.S., Ph.D.)
Plant Physiology (M.S., Ph.D.)
Plant Protection and Pest Management (M.S.)
Political Science (M.A., Ph.D.)
Preventive Veterinary Medicine (M.P.V.M.) — refer to
School of Veterinary Medicine
Psychology (M.A., Ph.D.)
Range Management (M.S.)
Rhetoric (M.A.)
Russian (M.A.)
Sociology (M.A., Ph.D.)
Soil Science (M.S., Ph.D.)
Spanish (M.A., Ph.D.)
Statistics (M.S., Ph.D.)
Textiles (M.S.)
Vegetable Crops (M.S.)
Veterinary Medicine (D.V.M.) — refer to School of
Veterinary Medicine
Water Science (M.S.)
Zoology (M.A., Ph.D.)

Graduate Groups

Programs sponsored by graduate groups with faculty drawn from more than one department are listed below. If you are interested in one of these areas, write to the chairperson for more information.

Agricultural Education

Mary C. Regan, Ph.D.
Applied Behavioral Sciences

Agricultural and Environmental Chemistry

Cornelius S. Ough, D.Sc.
(Viticulture and Enology)
101 Enology Building (752-0696)

Anatomy

George H. Cardinet III, D.V.M., Ph.D.
1271C Haring Hall

Animal Behavior

Peter S. Rodman, Ph.D.
(Anthropology)
328 Young Hall (752-0745/1988)

Atmospheric Science

Bryan C. Weare, Ph.D.
(Land, Air and Water Resources)
139 Hoagland Hall

Avian Sciences

C. Richard Grau, Ph.D.
109 Asmundson Hall (752-1300)

Biochemistry

Mark G. McNamee, Ph.D.
149 Briggs Hall (752-3611)

- Biomedical Engineering**
James F. Shackelford, Ph.D.
(Mechanical Engineering)
2020 Bainer Hall (752-0580/2842)
- Biophysics**
David W. Deamer, Ph.D.
5330 Storer Hall
- Botany**
Richard H. Falk, Ph.D.
274 Robbins Hall
- Child Development**
Susan Crockenberg, Ph.D.
(Applied Behavioral Sciences)
129 AOB-IV (752-0770)
- Clinical Psychology**
Margaret S. Steward, Ph.D.
UC Davis Medical Center
4430 V Street (453-2609)
Sacramento, CA 95817
- Community Development**
(Applied Behavioral Sciences)
106 AOB-IV (752-2244)
- Comparative Literature**
Robert M. Torrance, Ph.D.
912 Sproul Hall
- Comparative Pathology**
David R. Strombeck, D.V.M., Ph.D.
3121 Medical Science 1A
- Computing Science**
V. Ralph Algazi, Ph.D.
Electrical and Computer Engineering
- Earth Sciences and Resources**
Kenneth L. Verosub, Ph.D.
(Geology)
175 Geology-Physics Building
(752-6911/0350)
- Ecology**
R. Merton Love, Ph.D.
Ecology Graduate Group
2148 Wickson Hall (752-6751)
- Endocrinology**
Howard A. Bern, Ph.D.
4079 Life Sciences Building, UC Berkeley
- Engineering**
Warren H. Giedt, Ph.D.
2006 Bainer Hall
- Food Science**
Gerald F. Russell, Ph.D.
(Food Science and Technology)
4440 Chemistry Annex
- Genetics**
S. Richard Snow, Ph.D.
357 Briggs Hall (752-0200)
- Horticulture**
Wesley P. Hackett, Ph.D.
140 Environmental Horticulture
- Immunology**
Eli Benjamini, Ph.D.
(Medical Microbiology)
3147 Medical Science 1A (752-3156)
- International Agricultural Development**
Donald R. Nielsen, Ph.D.
(Land, Air and Water Resources)
113 Veihmeyer Hall
- Linguistics**
Lenora Timm, Ph.D.
905 Sproul Hall
- Microbiology**
David Pratt, Ph.D.
(Bacteriology)
258 Hutchison Hall (752-0262)
- Nutrition**
Hubert Heitman, Jr., Ph.D.
210 Animal Science
- Pharmacology and Toxicology**
Theodore C. West, Ph.D.
(Pharmacology)
4453 Medical Science 1A (752-3200)
- Physiology**
James M. Boda, Ph.D.
(Animal Physiology)
192 Briggs Hall
- Plant Physiology**
Barbara D. Webster, Ph.D.
(Agronomy and Range Science)
Hunt Hall (752-2468)
- Plant Protection and Pest Management**
Steven R. Radosevich, Ph.D.
367 Briggs Hall
- Preventive Veterinary Medicine**
Walter W. Sadler, D.V.M., M.P.H.
2079 Haring Hall
- Range Management**
R. Merton Love, Ph.D.
227 Hunt Hall
- Soil Science**
H. Michael Reisenauer, Ph.D.
(Land, Air and Water Resources)
139 Hoagland Hall (752-1406)
- Statistics**
Julius S. Blum, Ph.D.
469 Kerr Hall
- Textiles**
S. Haig Zeronian, Ph.D.
(Division of Textiles and Clothing)
129 Everson Hall (752-6550)
- Water Science**
James W. Biggar, Ph.D.
(Land, Air and Water Resources)
113 Veihmeyer Hall





ADMISSION STANDARDS

Students admitted to graduate status at the University of California must hold a bachelor's degree or the equivalent from an institution of acceptable standing and must have evidence of high scholastic ability. Generally, a minimum grade-point average of B in upper division course work in the applicant's final two years of undergraduate study, or evidence of comparable scholarship, is required. Meeting the minimum requirements does not assure admission; students who are admitted are selected from among those applicants meeting the minimum standards.

Applications for admission are evaluated in terms of scholastic qualifications and formal preparation for the graduate field of study. An applicant whose scholastic record or undergraduate program of study is judged inadequate as a foundation for advanced academic or professional study may be denied admission. This procedure applies to all applicants, whether they come from schools or colleges within the University of California or elsewhere. Departments may have special requirements for admission to graduate status, and some departments and schools require an additional application for admission to their advanced degree program.

Application for Admission

Application forms may be obtained by writing to the Dean of the Graduate Division, University of California, Davis, CA 95616. APPLICATIONS FROM U.S. CITIZENS SHOULD BE ON FILE BY THE FOLLOWING DATES:

June 1 for Fall Quarter

October 1 for Winter Quarter

January 1 for Spring Quarter

APPLICATIONS FROM NON-CITIZENS MUST BE FILED ONE MONTH PRIOR TO THESE DATES. **HOWEVER, SINCE MANY DEPARTMENTS EFFECTIVELY CLOSE APPLICATIONS WELL IN ADVANCE OF THESE DEADLINES, EARLY FILING** (preferably eight to twelve months prior to the date of registration) **IS STRONGLY RECOMMENDED.**



The application must be accompanied by a money order or bank check for \$20 (\$25, effective for applications to Fall Quarter 1981) made payable to The Regents of the University of California. *This fee is non-refundable.* In cases where complete records are filed later than the above dates, registration may be delayed, thus making you liable for a late registration fee of \$10.

Official transcripts of record covering all college and university work completed to date, together with official evidence of degrees conferred, should accompany or immediately follow your application. A separate original and official record must be presented from each institution previously attended. **Your transcripts and all other official credentials are retained in the files of the Office of the Dean of the Graduate Division.** In addition to having your records sent to this office, you must have in your possession an official record for use in conferences with departments and for other purposes here. The Graduate Division office copy may not be borrowed.



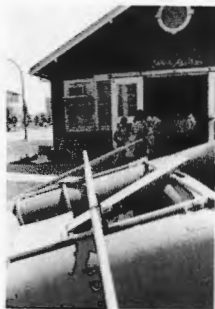
Applications for programs leading to a Ryan teaching credential or specialist credential, and for the degrees of Juris Doctor, Doctor of Medicine, Doctor of Veterinary Medicine, and Master of Preventive Veterinary Medicine must be filed directly with the appropriate department or professional school.

Reentry

If you were formerly enrolled in a regular session as a graduate student and wish to return, you must apply for reentry and pay the Reentry Application Fee of \$20 (\$25 effective for Fall Quarter 1981) at least six weeks before the beginning of the quarter in which you wish to enroll. The Reentry Application may be obtained from the Graduate Division. Transcripts of all work undertaken since you were last registered in graduate status at Davis must be presented with the Reentry Application. (There is no assurance of reentry, as applicants for reentry will be considered in competition with other applicants for the program.)

International Students

Applicants for admission to the Graduate Division with credentials from universities and colleges in foreign countries are advised to make their initial inquiry at least one year before the date of intended enrollment to permit processing of records.



If your undergraduate preparation has been in a language other than English, you must furnish positive evidence that your command of both spoken and written English will permit you to profit from the instruction offered. A report from the Test of English as a Foreign Language (TOEFL), which is administered by the Educational Testing Service for the College Board, is required. The TOEFL is given three times a year at many testing centers abroad, and full information is available from the Educational Testing Service, Princeton, N.J. 08540.

On arrival, international students take the special University examination in English. Those who do not pass are assigned to remedial courses. Even though you have been admitted, registration may be deferred until you acquire an adequate command of English.

Graduate Study Without an Advanced Degree Objective

If you do not wish to become a candidate for a higher degree, you may be admitted to a specified field of study for course work only. Such a program, which requires the approval of the Dean of the Graduate Division, must have a definite scholarly or professional purpose. The scholastic requirements for admission are the same as those for degree programs.

GENERAL REQUIREMENTS FOR ADVANCED DEGREES

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 the Graduate Division, 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 up to one-half of the unit requirement in courses from another campus of the University — if the units were not used to satisfy the 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 degree Doctor of Philosophy as granted at the University of California is not merely certification of having fulfilled technical requirements such as residence and the completion of fundamental courses. It means that the recipient possesses knowledge of a broad field of learning and has given evidence of dis-

tinguished 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 which must be completed prior to your admission to the Qualifying Examination.

The Qualifying Examination is administered by a committee appointed by the Dean of the Graduate Division. The Examination is intended to demonstrate your critical 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, you may repeat the Examination one time.

After successful completion of the Qualifying Examination, you are advanced to Candidacy for the degree. At this time, a committee is appointed to direct you in your research problem and guide you in the preparation of the dissertation.

Normative Time to the Ph.D. Degree. The University of California has adopted a policy statement on the normative time in which students are expected to complete the requirements for the Ph.D. degree programs. This policy establishes the period of full-time registration in which a student entering a Ph.D. degree program with a bachelor's degree and without any stated deficiencies should be able to complete the requirements of a particular program. The normative time for Ph.D. programs at Davis is expressed in terms of academic years, each academic year being comprised of three quarters in full-time registered status. The normative time for all Ph.D. programs at Davis is either four or five academic years.

Under the normative time policy, the University policy on continuous registration from the first quarter of enrollment to completion of degree requirements, unless on an approved leave of absence, will be strictly enforced. There is a financial incentive for completing the Ph.D. program within the normative time; students formally advanced to candidacy are currently eligible each quarter for a partial fee-offset grant until completion of the Ph.D. degree or until the cumulative time in graduate status at UCD exceeds the normative time to degree in a student's field of study.

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 undergradu-

ate training, and may include undergraduate courses to remove deficiencies. Each student must satisfy the degree requirements as published in the *Announcement of the Graduate Division*. 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.

INTERCAMPUS EXCHANGE PROGRAM

As a graduate student registered on any campus of the University, you may become an Intercampus Exchange Student with the approval of your graduate adviser, the chairperson of the department or group in which you wish to study on the host campus, and the Dean of the Graduate Division on both the home and the host campuses.

Although as an Intercampus Exchange Student you have library, health service, and other student privileges on the host campus, you are considered a graduate student in residence on your home campus. The grades obtained in courses on the host campus are transferred to your home campus and entered on your official record.

Application forms may be obtained at the Office of the Dean of the Graduate Division six weeks prior to the beginning of the quarter in which you wish to participate in the program.

FELLOWSHIPS, ASSISTANTSHIPS, AND LOANS

Fellowships are awarded by the Fellowship Committee of the Graduate Council on the basis of scholarship and promise of outstanding academic and professional contribution. Applicants who plan to enter in a Fall Quarter and 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 graduate status at Davis you must file an application for fellowship and graduate scholarship for continuing students with your major department or graduate group chairperson on or before January 15. Applications for both new and continuing students may be obtained from the Graduate Admission/Fellowship Office, 252 Mrak Hall.

Teaching assistantships and research assistantships are available in many departments. Interested students should inquire at the office of the department in which they wish to study.

Information regarding Graduate Fellowships that are supported by various Federal and outside agencies is available at the Graduate Division.

The Financial Aid Office has information about loans for graduate students (see page 39).

TEACHER CREDENTIAL PROGRAM

The teacher education program at UC Davis is administered by the Graduate Division.

Acceptance into the *multiple-subject teaching credential (elementary) program* does not require any specific campus major. If you are accepted to this program, you can meet the State requirements for a diversified major by completing a regular University major and one of the following alternatives:

- The additional requirements for the newly approved UC Davis Diversified Waiver Program;
- The additional requirements for the newly approved Mexican-American (Chicano) Studies Diversified Waiver Program; OR
- Achieving a passing score on the National Teachers Examination (Common Section).

California State *single-subject teaching majors (secondary)* for which Davis students can qualify are: agriculture, art, English (including drama and speech), foreign languages, government, history, home economics, life science, mathematics, music, physical education, physical science, and social science. For information concerning University majors and campus waiver programs which satisfy these single-subject majors, or State-approved examinations available to test competence in these single-subject majors, consult the appropriate adviser in the departments of Education or Applied Behavioral Sciences.

Admission to the teacher education program is by the Graduate Division. Eligibility requires a scholarship record of B (3.0) or better in all upper-division work undertaken in the last two years of undergraduate study. For the 1981-82 program, applications and filing deadlines should be obtained from the departments of Education, 174 Kerr Hall or Applied Behavioral Sciences (home economics and agricultural education), 106 AOB-IV.

Recent legislation makes the teacher education program also available to upper-division students. With careful planning it is possible for some students to complete requirements for a preliminary credential as undergraduates. This credential allows you to teach for five years while finishing the fifth year of academic work required for the clear credential. Specific requirements may be obtained from the Department of Education.

Students considering teaching as a career should consult the departments of Education or 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.



Professional Schools

Requirements and Preparation

Eligibility for admission to one of the University of California professional schools or curricula is contingent upon the successful completion of an undergraduate program of preprofessional training of 2 to 4 years, depending upon requirements for specific schools. Announcements and information describing admission and course requirements for a particular school are available by writing to the school of your choice in care of the appropriate University campus.

Legend and addresses:

- (B) University of California, Berkeley 94720
- (D) University of California, Davis 95616
- (I) University of California, Irvine 92717
- (LA) University of California, Los Angeles 90024
- (R) University of California, Riverside 92502
- (SD) University of California, San Diego, La Jolla 92093
- (SF) University of California, San Francisco 94143
- (SB) University of California, Santa Barbara 93106
- (SC) University of California, Santa Cruz 95064

Direct inquiries about schools and curricula in San Francisco (except Hastings College of the Law) in care of: Office of Student Admission.

Professional schools and curricula requiring 2 to 3 years of undergraduate preparation:

- School of Business Administration (B)
- School of Criminology (B)
- Curriculum in Cytotechnology (SF)
- Curriculum in Dental Hygiene (SF)
- Schools of Dentistry (LA, SF)
- Curricula in Education (B, D, I, LA, R, SB, SC)
- School of Engineering (I)
- School of Engineering and Applied Science (LA)
- School of Forestry and Conservation (B)

- School of Journalism (B)
- Curriculum in Medical Illustration (SF)
- Curriculum in Medical Technology (SF)
- Schools of Medicine (D, I, LA, SD, SF)
- Schools of Nursing (LA, SF)
- School of Optometry (B)
- School of Pharmacy (SF)
- Curriculum in Physical Therapy (SF)
- Schools of Public Health (LA, B)
- School of Veterinary Medicine (D)

Professional schools requiring a bachelor's degree in appropriate field of study for admission:

- Graduate Schools of Administration (D, I, R)
- School of Architecture and Urban Planning (LA)
- Graduate Schools of Business Administration (B, LA)
- Schools (or Departments) of Education (B, D, I, LA, R, SB, SC)
- Preparation for education credentials is available as follows:
 - Kindergarten — Primary (LA, SB)
 - Elementary Teaching (B, D, I, LA, R, SB, SC)
 - Secondary Teaching (B, D, I, LA, R, SB, SC)
 - Special Education (R)
 - Special Secondary (D, SB)
 - Junior College Teaching (B, LA, R, SB)
 - Pupil Personnel Services (B, SB)
 - Reading Specialist (D)
 - School Librarianship (B, LA)
 - School Psychology (B, D, SB)
 - Special Services (LA, SB)
 - Supervision (B, LA)
 - Administration (B, LA)
 - Graduate School of Journalism (B)
 - Schools of Law (B, D, LA)
 - Hastings College of the Law (SF)
 - School of Librarianship (B)
 - School of Library and Information Science (LA)
 - Graduate School of Public Policy (B)

Schools of Public Health (LA, B)
Schools of Social Welfare (B, LA)
Scripps Institution of Oceanography (SD)

PREPROFESSIONAL TRAINING

Preprofessional programs do not — in and of themselves — lead to a bachelor's degree. Since professional schools cannot accommodate all qualified applicants, students should prepare themselves for alternate careers and are expected to pursue a major program while completing their preprofessional requirements.

With careful planning it is possible for students to undertake any one of a variety of majors. While most students interested in the health sciences will elect a major within the biological sciences, majors as varied as psychology, engineering, and art can be equally acceptable. Law schools, in particular, do not prescribe any specific major program. They give equal consideration to all qualified applicants completing a course of study which gives them a broad cultural background and includes intensive work for a substantial period of time in a selected field of study.

REFERRAL INFORMATION

Although the Davis campus offers course work in preparation for admission to most of the schools listed above, the referral information which follows relates to the types of preprofessional training in greatest demand at Davis.

Students are strongly urged to read this catalog and the appropriate professional school announcement carefully before consulting faculty and staff about admission requirements. Communicate directly with personnel at the professional school to which you expect to apply if you need more detailed information. A list of general reference books which may be of interest is presented at the conclusion of this section.

ADMINISTRATION

A **Graduate School of Administration** is being established on the Davis campus to offer a Master of Administration degree, with the first class to be admitted by the fall of 1981. The two-year graduate program will involve both public and private administration. (See page 113 for details.)

BUSINESS ADMINISTRATION AND PUBLIC POLICY

Preparation for study: See published announcements of schools of business administration and public policy. For advice and counsel, see the departmental advisers in the Department of Economics (380 Kerr Hall, 752-0741) or Agricultural Economics (118 Voorhies Hall, 752-1517); or see the Pre-Business School (Peer) Adviser located in 359 Kerr Hall, 752-6512.

FORESTRY

Preparation for Study: Consult this catalog (pages 69, 81, 282) and the announcement of the Department of Forestry and Conservation, UC Berkeley.

Preforestry advisers: Jack Major (Botany Department, 7 Robbins Annex, 752-0621 or 752-0617) or C.C. Delwiche (Land, Air and Water Resources, 273 Hoagland Hall, 752-1511 or 752-1409).

LAW

Preparation for study: Consult this catalog (page 115), school announcements, and the annual *Prelaw Handbook — Official Law School Guide*, prepared and published by The Association of American Law Schools and the Law Admission Council.

Advising: Students interested in legal careers should consult the Pre-Law Adviser, Pre-Law Advising Office, South Hall, 752-3009. Information is available about law school admission procedures, academic program planning (see also page 29), and career possibilities.

School of Law, UC Davis: Consult this catalog (page 115), the *Announcement of the School of Law*, or the Law School Admissions Office, 115 King Hall, 752-6477.

HEALTH SCIENCES

At the Davis campus only preparatory work is offered. Professional training for all fields except Medicine and Veterinary Medicine must be completed elsewhere. Degree work is offered at Davis for dietetics, but students must apply elsewhere for the required post-graduate internship. Information regarding careers in dietetics or nutrition can be obtained from the Nutrition Department or the Work-Learn and Career Planning and Placement Center on campus. Contact the Health Sciences Advising Office, South Hall (phone 752-2672) regarding curricula and schools for all health science fields.

Suggested Curricula. As specific school requirements vary, students should either contact the schools directly, or contact the Health Sciences Advising Office for more detailed information. Students transferring into a professional program offered at the undergraduate level must complete that school's general education requirements.

Students are advised that in California most professional programs are unable to accommodate all applicants. Students may wish to consider applying also to out-of-state programs. Professional school admissions committees evaluate applicants on the basis of their course work and grades, work experience in health care, and community activities, and letters of recommendation.

Courses listed under each of the following health fields of study are *general requirements only*.

Clinical Laboratory Technology

To qualify for the required twelve-month medical technology traineeship in California, students need to complete a baccalaureate degree, which includes the following minimum coursework requirements as specified by the State Department of Health.

Biological sciences: 27 units, including instruction in hematology (Clinical Pathology 101), immunology (Veterinary Microbiology 126 or Medical Microbiol-

*You have to be
creative and will-
ing to experiment
to succeed.
— Freshman,
Biochemistry*



ogy 107), and medical microbiology (Veterinary Microbiology 127).

Chemistry: 24 units, including Chemistry 1A, 1B, 1C, 5 and Biochemistry 101A-101B or Physiology 110. Physics 2A, 2B, 2C.

Mathematics or calculus, at least one term.

Strongly recommended courses include: parasitology (Veterinary Microbiology 132, Medical Microbiology 215, or Entomology 156-156L); and a laboratory in clinical chemistry (e.g., Clinical Pathology 102 or Biochemistry 101L).

Recommended courses include: organic chemistry (Chemistry 8A-8B); physics (Physics 3A-3B-3C); hematology (Clinical Pathology 101L); immunology (Veterinary Microbiology 126L); medical microbiology (Veterinary Microbiology 127L); Physiolo-

gy 110-110L; virology (Veterinary Microbiology 128 or Biological Sciences 162); histology (Zoology 122).

Suggested electives: genetics (Genetics 100A-100B or 120); Human Anatomy 101; virology laboratory (Veterinary Microbiology 130); advanced immunology (Veterinary Microbiology 270); computer programming (Engineering 5, Mathematics 19, or 29); electronic instrumentation (Electrical and Computer Engineering 195A-195B); business management (Agricultural Economics 112).

Requirements vary among training programs. Students should check the individual program for additional required courses.

Dentistry

Students complete three to four years of preprofessional course work prior to admission to the three- or four-year dental curriculum. The Dental Admission Test should be taken in April, one year prior to projected date of admission. Check individual catalogs for exact prerequisites.

Biological sciences (at least one year with laboratory). Strongly recommended: Biological Sciences 1; Zoology 2-2L; Physiology 110-110L; Zoology 100-100L; Biochemistry 101A-101B. Recommended: Zoology 105 or 106, Bacteriology 2, and 3 or 102.

Chemistry 1A-1B-1C, and 8 to 12 units of organic chemistry with laboratory (e.g., courses 128A-128B-128C and 129A are usually taken, but, in some schools, courses 8A-8B, and 128A and 129A may be substituted). Check individual catalogs for specific requirements.

English: one year. (Rhetoric classes may not be substituted for English.)

Physics 2A-2B-2C, 3A-3B-3C.

Psychology: two courses. Recommended: Psychology 1, 16, 112, or 168.

Suggested electives: Statistics 13 or Agricultural Science and Management 150; Mathematics 16A-16B-16C; Genetics 100A-100B or 115; sculpture course, art practice (Art 11).

Health Care Administration

A public administration or business management orientation is recommended for the baccalaureate and master's degree work. Schools of public health and graduate school programs in administration offer professional training. Elective courses may be selected from the following:

Agricultural Economics (e.g., courses 18, 112, 117, 171A, 171B).

Applied Behavioral Sciences (e.g., courses 151, 152, 153, 154, 155, 160A, 160B, 162, 163, 164, 172).

Community Health 101, 121, 126, 204.

Economics (introductory and accounting, courses 131, 134, 150A, 151A).
Engineering 5, 10, 15.
Epidemiology and Preventive Medicine 102, 103A, 103B, 103C.
Food Service Management 123.
History (e.g., courses 171C, 174A-174B, 185B).
Statistics 13 or Agricultural Science and Management 150; Mathematics 19.
Political Science (e.g., courses 100, 101, 102, 156, 180, 181, 182, 183, 187, 188).
Psychology 1, 112, 115, 168.
Rhetoric 1, 3.
Sociology (e.g., courses 154, 180).

Medicine

Students complete three to four years of preprofessional course work prior to admission to medical school. The Medical College Admission Test must be taken at least one year prior to expected date of admission. Check individual medical college catalogs or contact the Health Sciences Advising Office for specific requirements for each school. Any major is appropriate for admissions; the following courses are required by most schools.

Biological sciences: five quarters, with laboratory. (Biological Sciences 1, Zoology 2-2L, Physiology 110, 110L, Bacteriology 2, 3 recommended).
Chemistry 1A-1B-1C; one year organic, with laboratory (e.g., Chemistry 8A-8B-128A-129A or preferably 128A-128B-128C and 129A-129B-129C).
Physics: one year, with laboratory (e.g., 2A-2B-2C, 3A-3B-3C).
English: one year.
Recommended: one year of calculus (e.g., Mathematics 16A-16B-16C).

Nursing

Two years are usually required to complete prerequisites prior to transferring into two- or three-year baccalaureate nursing programs. General requirements include:

Bacteriology 2, 3.
Chemistry 1A, 1B, 8A, 8B.
English 1, 3.
Human Anatomy 101, 101L.
Physiology 2-2L or 110-110L.
Psychology 1.
Sociology 1.
Recommended courses include: Nutrition 10 or 110; Human Development 100A or Psychology 112; Anthropology 2; Rhetoric 1, 3; Physics 3A, 10; Zoology 2, 2L; Family Practice 127; Community Health 101; Psychiatry 255, 256; Biological Sciences 19, Psychology 15 or 108.

Specific requirements are subject to change; students are advised to contact specific schools regarding additional requirements. An R.N. license may also be

earned through Associate degree programs (A.S. or A.A.) offered by community colleges or through hospital diploma programs.

Occupational Therapy

Basic preprofessional training may be taken either at the undergraduate or graduate level. Students must transfer to another school to obtain professional training. Applicants are expected to be proficient in some arts and crafts activities and preferably knowledgeable in some industrial arts and recreational skills.

Biological Sciences 1.
Chemistry 1A, 1B.
English 1 or 3.
Human Anatomy 101, 101L.
Human Development 100A-100B or Psychology 112.
Physiology 2-2L, or 110-110L (recommended).
Psychology 1, 16, 168.
Rhetoric 1 or 3.
Sociology: one course or Anthropology 1 and 2.
Suggested electives: Human Development 100C, 102, 130, 131, 141; additional psychology; Physics 2A-2B-2C, 3A-3B-3C, 10; Physiology 111A-111B, 112-113; Community Health 101; Genetics 10; Nutrition 10; art and design courses; Physical Education 103, 105, 113, 125, 131; Behavioral Biology 451, 468; Family Practice 127, 406A, 406B, 406C. CSU San Jose requires a "skills" course.

Optometry

Two years minimum preparation is required prior to transfer into a four-year Doctor of Optometry degree curriculum. Students must take the Optometry College Admission Test, one year prior to projected date of admission. Test is usually given in November, January and March. Check individual catalogs for exact prerequisites.

Biological sciences (one year with laboratory). Recommended: Biological Sciences 1; Bacteriology 2 or 102 and 3; Zoology 2-2L or 105 or 106 or Human Anatomy 101 or Anatomy 100; Physiology 2-2L or 110-110L.
Chemistry: one year of general (Chemistry 1A, 1B, 1C) and one year of organic with laboratory (8A, 8B and 128A-129A or 128A-128B-128C and 129A-129B-129C). Required by a few schools: 9 units of organic chemistry.
English: one year (may include rhetoric).
Mathematics 16A-16B. Required by some schools: Mathematics 16C; Statistics 13. Agricultural Science and Management 150 may be substituted.
Physics 2A-2B-2C, 3A-3B-3C.
Psychology: two courses, Psychology 1 and one upper division course.
Suggested electives: economics, sociology, biochemistry, additional biological sciences.

Pharmacy

One to two years minimum preprofessional course work is required prior to transfer to professional training. Students may be required to take the Pharmacy College Admission Test one year prior to projected date of admission. Each school has its own requirements; experience in the field is usually required; USC requires its own examination. Check individual catalogs.

Biological sciences (one year with laboratory). Recommended: Zoology 2-2L, 100; Bacteriology 2 or 102, 3; Biological Sciences 1.

Chemistry: one year of inorganic chemistry with laboratory (Chemistry 1A-1B-1C); one year of organic with laboratory (Chemistry 128A-128B-128C-129A-129B-129C). UCSF requires Chemistry 5, but no organic chemistry.

Economics: one macroeconomics course. A few schools require Economics 1A-1B.

English: one year, composition and literature course. Mathematics 16A, 16B, 16C.

Physics: one year physics with laboratory (Physics 2A-2B-2C, 3A-3B-3C).

Psychology: one course.

Suggested electives: courses in behavioral psychology, speech, communication, sociology, anthropology, history, and political science.

Physical Therapy

Basic preprofessional training is available for both the undergraduate and graduate levels; students must obtain preprofessional training from another school. Each physical therapy program has its own specific requirements. General requirements include:

Biological Sciences 1.

Chemistry: 1A, 1B. Recommended: 1C, 8A, 8B.

English 1, 3.

Human Anatomy 101, 101L.

Physics 2A, 3A. Many schools require also Physics 2B, 2C, 3B, 3C.

Physiology 2-2L or 110-110L (110-110L strongly recommended.)

Psychology 1 and 168.

Rhetoric 1, 3.

Statistics 13.

Suggested electives: Human Development 100A-100B or Psychology 112 and Human Development 100C, 131, 141; Bacteriology 2 and 3; Sociology 1, 3; Zoology 2-2L, 106, 143; Anatomy 215; Physical Education 101, 102, 103, 105, 113, 125, 131; Chemistry 1C; Behavioral Biology 451; Community Health 101; Family Practice 127; additional psychology.

Physician Assisting

Physician Assistant programs often require courses in biology and chemistry, and up to two years of college. One to two years of direct patient care (i.e., nurse, orderly, corpsman) are advisable to meet minimum

prerequisites. The majority of the programs are for training people who are interested in assisting the primary care physician in a rural setting, but training in a specialty and employment in urban settings are also available.

Speech Therapy

Students must transfer to another school for preprofessional and professional training through a master's degree or special teaching credential program.

Speech therapy and audiology programs are highly specific in their entrance requirements at both the undergraduate and graduate levels. UC Davis offers courses that satisfy a few of the requirements, however it has no preprofessional major for these fields. For information on courses at Davis which are acceptable toward specific programs in speech therapy and audiology, you may contact either the Health Sciences Advising Office or the professional program in which you are interested.

School of Medicine, UC Davis: Consult page 119 of this catalog, the *School of Medicine Bulletin*, or the Office of Student Affairs, School of Medicine, 752-3170.

School of Veterinary Medicine, UC Davis: Consult this catalog, page 123, the *Announcement of the School of Veterinary Medicine*, or the Office of Student Services, School of Veterinary Medicine, 752-1383.

REFERENCE BOOKS

School catalogs and reference texts are available in the Reference Room of the Shields Library, the Health Sciences Library, or the Health Sciences Advising Office: Some recommended publications are as follows:

American Universities and Colleges, edited by the American Council on Education.

Graduate Programs and Admissions Manual, published by the Graduate Record Examination Board and the Council of Graduate Schools in the United States.

Admission Requirements of American Dental Schools, published by the American Association of Dental Schools.

Medical School Admission Requirements U.S. and Canada, published annually by the Association of American Medical Colleges.

Pharmacy School Admission Requirements, published annually by the American Association of Colleges of Pharmacy.



School of Administration

Information:
Graduate School of Administration
112 Voorhies Hall
752-7362/7363

The Graduate School of Administration expects to admit its initial class in Fall Quarter 1981. At maturity, the School will have approximately 300 students and a faculty of approximately 25.

The degree of Master of Administration requires the satisfactory completion of a two-year course of study comprising six quarters. In addition to completing an approved sequence of courses and seminars, degree candidates are expected to complete intensive supervised internships in approved organizational settings.

The basic premise of the Graduate School of Administration is that administration has a generic character such that many of its concepts and principles are applicable in both the private and public sector. Drawing on many disciplines, the program offers first-year students a central core of courses which set forth administration's general components and build a foundation for subsequent specialization. These courses will cover economic analysis, policy analysis, quantitative methods, and organizational theory and behavior. During the second year, students take specialized courses which will prepare them to become practitioners in the public or private sectors. Fields of specialization will include business management, financial management, and management of public programs. Additional concentrations in engineering management and environmental and natural resources management are under consideration.

Admission Requirements

A bachelor's degree and a firm interest in professional management are prerequisites for admission to the Graduate School of Administration. Although the program and certain concentrations within the program will have specific prerequisites (such as elementary statistics and microeconomic theory) students may be conditionally admitted pending completion of specific prerequisites. The School hopes to draw students from

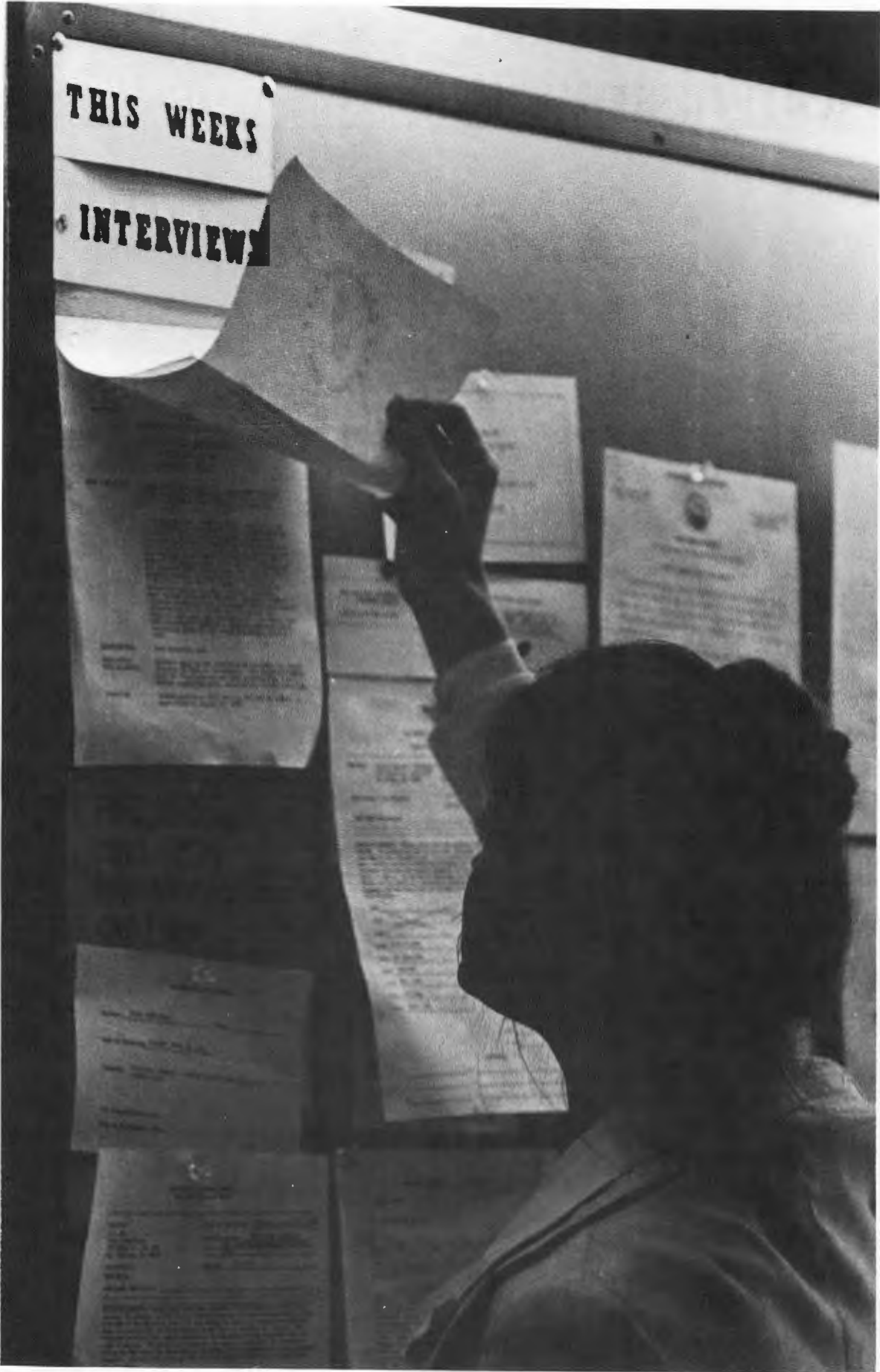
diverse backgrounds, both in terms of working experiences and the disciplines in which the bachelor's degree was awarded.

The admissions committee will require:

- Transcripts from all previously attended institutions of higher education
- Scores from the Graduate Management Admissions Test, and
- Three letters of recommendation and a personal statement.

Admission Procedures

Interested applicants should write to the Dean, Graduate School of Administration, University of California, Davis, CA 95616, for a full description of admissions requirements and procedures. Students applying for fellowships and scholarships must apply before January 15, 1981. Application and supporting materials for regular admission must be received no later than *March 1, 1981*.



School of Law

Information:
Dean's Office
School of Law
1011 King Hall
752-0243

The School of Law offers a three-year professional curriculum leading to the degree of Juris Doctor. The fall of 1980 will see the School enroll its fifteenth class.

The program of the School is designed to combine the best features of traditional legal education with the development of new interests and approaches necessary for training lawyers to meet the demands of the future. In addition to the traditional professional curriculum, the School 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, and experience in the community. It also 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 communicate easily, persuasively, and accurately; to understand people and institutions; to gather and weigh facts; and to solve problems and think creatively. You should be able to read rapidly with comprehension, and express yourself clearly, completely, and concisely, both orally and in writing — in

short, it is most important that you obtain mastery of the English language.

Assistance in program planning may be obtained from the Pre-Law Advising Office, South Hall, 752-3009 (see pages 29 and 108).

For additional information, see the official *Pre-Law Handbook*, 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 most American law schools. It may be found at college bookstores or ordered from Law School Admissions Council, Box 2000, Newtown, PA 18940.

ADMISSION

Requirements for Admission

Your application for admission to the School of Law's professional curriculum must show a record of sufficiently high caliber to demonstrate qualification for the study of law. A bachelor's degree or an equivalent degree from an approved college or university must be earned prior to the time you begin work in the School.

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). Applicants with LSAT scores below 400 will not be considered. Applicants with LSAT scores between 400 and 450 and undergraduate GPAs below 3.0 are rarely admitted. The Committee seeks students of diverse backgrounds. In this regard, the Committee 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 major concerns.

Students are admitted only on a full-time basis and *only in August*.

Law School Admission Test (LSAT)

All applicants are required to take the Law School Admission Test administered by the Educational Testing Service. Testing centers have been established for the convenience of applicants in all parts of the United States and in many foreign countries. Tests are given four times a year: February, June, October, and December. If at all possible, you should take the test by October, and in any event not later than December, for admission the following fall. The completed test application blank, accompanied by the fee, must be post-marked at least 30 days before the date of the test to insure the applicant's being registered.

To obtain application forms, information about the test, specific test dates, and the location of testing centers, write to: Law School Admission Test, Law School Admission Services, Box 2000, Newtown, PA 18940.

Admission Procedures

Complete details of admission procedures are included in the School's bulletin, *Announcement of the School of Law*.

1. Application for admission to the School of Law and to the Graduate Division of the University for the program leading to the degree of Juris Doctor should be made on forms supplied by the School. Application forms and the School bulletin may be requested from the Office of Admissions, School of Law, University of California, Davis, CA 95616. *The completed application must be returned to that same office, accompanied by a \$25 nonrefundable 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 *March 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. No application will be considered if received after March 1 of the year in which admission is sought.

2. Applicants must take the Law School Admission Test and request that the score be reported to the School. You are urged to take the test as early as possible, and in no event later than December preceding the year in which admission is sought.

3. You should register with the LSDAS no later than December 1 by completing and mailing the registration form supplied with each LSAT/LSDAS information packet. A transcript from each college or university attended should then be sent directly to the Law School

Data Assembly Service, Law School Admission Services, Box 2000, Newtown, PA 18940.

4. An official transcript of college work completed during the first semester or quarter of the applicant's senior year *must* be submitted 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 are required to submit directly to the School of Law a final transcript showing the award of a bachelor's degree.

5. Two letters of recommendation from objective and responsible persons to whom you are well known must be provided. 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 sent directly to the Office of Admissions before the Law School Admissions Committee can seriously consider your application.

6. When accepted by the School of Law, you are simultaneously admitted to the Graduate Division 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 page 117), you must make separate application to the Graduate Division prior to 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 admitted to advanced standing with credit for not more than one year of such work. 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 from the dean of any law school previously attended indicating that you are in good standing; (2) at least one letter of recommendation from a law professor; and (3) transcripts of all law school work. 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 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.

Minority Recruitment

The students and faculty of the UCD School of Law recognize the desperate need for minority lawyers. The School, therefore, actively solicits applications from Native American, Black, Philipino, Asian, and Chicano students. Obviously, a legal career is neither the only nor, in many instances, the most desirable way to deal with racism, poverty, and the myriad social, political, and economic problems which besiege this country — but it is one way to approach their solutions.

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 minority law students. CLEO applications may be obtained by writing to: Council on Legal Education Opportunity, 818 18th Street N.W., Suite 940, Washington, D.C. 20006.

Applications for the special summer program for Native American students may be obtained from the School of Law, University of New Mexico, 1117 Stanford Drive N.E., Albuquerque, N.M. 87106.

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, 28 Geary Street, 6th Floor, San Francisco, CA 94108.

PROFESSIONAL CURRICULUM AND DEGREE

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.

When you satisfactorily complete the professional curriculum of 84 semester units, and the required period of resident study, you will be recommended for 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, a 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 beginning on page 235.

Combined Degree Programs

Students with interests in areas such as anti-trust, business, labor law, criminal law, or ecology, 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 3½ to 4 years. You will usually be able to earn up to 8 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, course work 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.

Degree programs are presently available in combination with the UC Berkeley School of Business for the M.B.A. degree, and with UCD departments for the M.A. degree in economics and sociology. 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 prior to 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 indicate this on the School of Law admission form.

SEMESTER SYSTEM

The School of Law operates on a semester system rather than the quarter system used on the remainder of the Davis campus.

Academic Calendar 1980-81

	Fall 1980	Spring 1981
First-year Introductory Program begins	Sun, Aug 17	
Law School instruction begins	Mon, Aug 25	Mon, Jan 12
Labor Day holiday	*Mon, Sept 1	
Thanksgiving holiday period*	Thurs-Fri, Nov 27-28	
President's holiday*		Mon, Feb 16
Spring vacation period		Mon-Fri, Mar 23-27
Spring instruction resumes		Mon, Mar 30
Law School instruction ends	Fri, Dec 5	Fri, May 1
Reading period	Sat-Wed, Dec 6-10	Sat-Wed, May 2-6
Law school examination period	Thurs-Tues, Dec 11-23	Thurs-Fri, May 7-22
Last day of semester	Tues, Dec 23	Fri, May 22
Law School Commencement		Sat, May 23

*Academic and administrative holiday.

APPLICATION MATERIALS

The *Announcement of the School of Law* and application materials may be obtained by writing to the Office of Admissions, School of Law, 115 King Hall, University of California, Davis, CA 95616.



School of Medicine

Information:
School of Medicine
752-2717

The Doctor of Medicine degree requires the satisfactory completion of a four-year course of study comprised 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.

With the start of the academic term in June 1977, the Medical Sciences-I (MS-I) Complex opened. The new MS-1 Complex provides two lecture halls (each with a capacity of 170), smaller conference rooms, the Health Sciences Library, the Health Sciences Bookstore, and student lounges. A four-story, 200,000-square-foot structure is primarily devoted to multidisciplinary laboratories and faculty offices.

ADMISSION POLICIES

The class entering in the fall of 1980 will be limited to 100 students selected on the basis of academic achievement and promise, as well as personal characteristics that lead the Admissions Committee to feel the candidates 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 vast majority of openings in the entering class will be awarded to students who are legal residents of the State of California. However, a few out-of-state students may be accepted. The School of Medicine also participates in the program of the Western Interstate Commission for Higher Education (WICHE). In this program are several states which do not offer professional graduate medical education. Applicants from such states found eligible by both the School of Medicine and their own states are charged resident rather than nonresident

tuition. Further information may be obtained by communicating with this Commission at Post Office Drawer P, Boulder, CO 80302.

Applicant Selection. 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.

Application Procedures

The School of Medicine participates in the centralized American Medical College Application Service (AMCAS). Application request forms are available from the School's Admissions Office after March 15 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. The completed application and other required credentials should be submitted 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 two letters of recommendation and a nonrefundable fee of \$25. These items should be sent 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. It is required that one letter be from a science instructor and the other from a non-science instructor.

Applications will be accepted by the Admissions Committee between June 15 and *November 1*. It is strongly recommended 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 notifies you of receipt of your completed application from AMCAS. The Committee reviews only complete application files and schedules interviews for highly qualified applicants throughout the application period and beyond.

A personal interview is 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. It is highly desirable that 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. Where circumstances warrant, interviews may be arranged by the Admissions Committee at other locations.

You will be notified of your status as soon as possible after a decision has been reached. As decisions are made, letters of acceptance are sent; this can be as early as mid-December and as late as September.

Transfer with Advanced Standing

Students may be admitted by action of the Admissions Committee at levels more advanced than the regular entering level but not beyond the beginning of the third year. Such applicants must meet the entrance requirements for regular status in the School of Medicine, must satisfactorily complete courses elsewhere that are substantially equivalent to those offered in the School of Medicine, and must meet the necessary requirements for the advanced status requested. Applicants may also be required to pass examinations to establish their qualifications for admission. An advanced standing

applicant must be a student in good standing at an approved medical school. At UCD the second- and third-year classes begin work in early July. Applications for admission to advanced standing will be accepted until *January 1* of the year in which admission is sought.

Premedical Requirements

Arrangements for taking the New Medical College Admission Test should be made at the institution at which you are presently enrolled, and the Examining Board should be requested to forward the results to the Chairperson of the Admissions Committee, UC Davis School of Medicine. Information about the test can be obtained at your undergraduate college or directly from MCAT Registration, Box 414, Iowa City, IA 52240. It is desirable that the results of the test be available at the time your qualifications are reviewed. The Admissions Committee recommends that, if feasible, tests be taken in the spring prior to application.

Applicants for admission to the professional curriculum must have satisfactorily completed a minimum of three years (90 semester units; 135 quarter units) of college-level work in an accredited school in the United States or Canada. In most instances, however, completion of a four-year course of study leading to a bachelor's degree is recommended.

Although a specific major in science is not necessary, the following course content at college level is required:

- a. English, one year or the equivalent
- b. Biological science, one year (including laboratory) or the equivalent
- c. General chemistry, one year (including laboratory) or the equivalent
- d. Organic chemistry, one year or the equivalent (If two or more undergraduate organic courses are offered, it is recommended that you elect the more rigorous option.)
- e. Physics, one year or the equivalent
- f. Mathematics, course work to satisfy prerequisites for integral calculus

Upon matriculation, each applicant must have both an overall grade-point average and science grade-point average of at least 3.0 (on a scale where one credit hour of A = 4 points). In calculating grade-point averages, such courses as physical education, military science, and courses taken for graduate degrees will be excluded. Grades of D in any of the required courses cannot be accepted. Required courses may not be taken on a Passed/Not Passed basis unless all courses at your undergraduate institution are graded this way.

While the minimal overall and science GPA requirements at the UCD School of Medicine have been established at 3.0, in exceptional cases a special waiver may be granted by the Faculty of the School of Medicine through the action of the Executive Committee and at the recommendation of the Chairperson of the Admissions Committee.

Applications may be submitted on the basis of work completed plus work in progress. However, all academic requirements must be completed by June 30 of the year for which admission is sought.

Although the minimum scholastic requirements are stated in some detail, it should not be inferred that admission is assured each applicant who meets these requirements. In addition to a high level of academic

competence, many other factors which determine success in pursuing a career in medicine are given full weight by the Admissions Committee before it reaches a final decision.

For additional information, contact the School of Medicine Admissions Office or request the *School of Medicine Bulletin* from the medical school Admissions Office.

Academic Calendar 1980-81

The School of Medicine operates on a different schedule from the remainder of the campus.

Quarter System

Summer 1980		Winter 1981	
Medical School instruction begins	Mon, June 23	Medical School instruction begins	Mon, Jan 5
Independence Day (academic and administrative holiday)	Fri, July 4	End of first half of instruction for Core C students	Fri, Feb 13
End of first half of instruction for Core C students	Fri, Aug 1	President's holiday (academic and administrative)	Mon, Feb 16
Second half of instruction begins for Core C students	Mon, Aug 4	Second half of instruction begins for Core C students	Tues, Feb 17
Quarter ends for Core B students	Fri, Aug 29	Quarter ends for Core A and B students	Fri, Mar 20
Labor Day (academic and administrative holiday)	Mon, Sept 1	Quarter ends for Core C students	Fri, Mar 27
Quarter ends for Core C students	Fri, Sept 12	Spring holiday (academic and administrative)	Mon, Mar 30
Fall 1980		Spring 1981	
Orientation for incoming class	Wed-Fri, Sept 24-26	Medical School instruction begins	Tues, Mar 31
Medical School instruction begins	Mon, Sept 29	End of first half of instruction for Core C students	Fri, May 8
End of first half of instruction for Core C Students	Fri, Nov 7	Second half of instruction begins for Core C students	Mon, May 11
Second half of instruction begins for Core C students	Mon, Nov 10	Quarter ends for Core B students	Fri, May 22
Thanksgiving holiday (academic and administrative)	Thurs-Fri, Nov 27-28	Memorial Day holiday (academic and administrative)	Mon, May 25
Quarter ends for Core A and B students	Tues, Dec 16	Quarter ends for 4th-year students	Fri, June 5
Quarter ends for Core C and 4th year students	Fri, Dec 19	Commencement	Fri, June 5
Christmas holiday (academic and administrative)	Thurs-Fri, Dec 25-26	Quarter ends for Core A students	Tues, June 16
New Year's holiday (academic and administrative)	Thurs-Fri, Jan 1-2	Quarter ends for Core C students	Fri, June 19



School of Veterinary Medicine

Information:
School of Veterinary Medicine
1044 Haring Hall
752-1383

The Doctor of Veterinary Medicine (D.V.M.) degree is granted upon completion of a course of study that usually requires eight years. The final four years must be spent in the professional veterinary medical curriculum. Most students planning a career in veterinary medicine broaden their educational experience by completing the baccalaureate degree before applying to the professional school.

PREPROFESSIONAL TRAINING AND REQUIREMENTS

Applicants must complete the equivalent of at least three full academic years in an accredited college or university before entering the School of Veterinary Medicine. At the time of application, the applicant must have earned the equivalent of at least 45 of the 58 quarter units of required science courses listed below.

You should plan your preveterinary medical education carefully. The required courses should be spaced to permit maximum scholastic achievement. The undergraduate program should include plans for obtaining a baccalaureate degree. 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 which will broaden their background in these areas. Some specialized areas include laboratory animal medicine, exotic animal medicine, public health, food animal diseases, and biomedical research. Veterinary and animal experience is considered an important part of your preprofessional training.

Subject Requirements

	Quarter Units
Chemistry (general, qualitative, organic, and biochemistry)	24
Genetics	3
Physics (general)	9
Physiology (systemic)	5
Biology, zoology, embryology (including laboratories)	17
English composition and additional English or rhetoric	8
Statistics	4
Total	70

Following is a list of courses taught on the UC Davis campus which fulfill the preceding subject requirements.

	Units
Biological Sciences 1	(5) 5
Physiological Sciences 101A or Biochemistry 101A	(4, 3) 3
Chemistry 1A-1B-1C, 8A-8B ..	(5-5-5, 3-3) 21
English 1 and additional English or rhetoric	(4, 4) 8
Genetics 100A or 120	(3, 4) 3
Statistics 13 or Agricultural Science and Management 150	(4, 4) 4
Physics 2A, 2B, 2C	(3, 3, 3) 9
Physiology 110	(5) 5
Zoology 2-2L, 100-100L	(4-2, 4-2) 12
Total	70

If you complete the requirements in an institution other than the University of California, Davis, you are urged to check carefully the catalog of your college to be sure you are taking courses comparable in content.



Application Procedures

Students are admitted to the School of Veterinary Medicine only in the fall. Application forms may be obtained any time after July 15 by writing to the Office of the Associate Dean — Student Services, School of Veterinary Medicine, University of California, Davis, CA 95616 or by calling (916) 752-1383. Applications and Graduate Record Examination (GRE) scores for both the General Aptitude Test and the Advanced Test in Biology must be received by this office no later than *October 1*. Therefore, GRE scores received from the September administration or later administrations of the year the application is filed will not be accepted for consideration. The GRE must be taken within the five-year period prior to the time the application is submitted. At the *time of application*, the equivalent of at least 45 quarter course units of the required sciences (listed above) must be completed.

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.

Admission to the School of Veterinary Medicine

Evaluation is based on academic and nonacademic records. The academic record is divided into the required science grade-point average, cumulative

grade-point average, and grade-point average for the last year of undergraduate studies. The scores from the Graduate Record Examination are included in the evaluation of your academic record. The principal non-academic criteria are animal experience, your narrative statement, and letters of evaluation. Other criteria considered helpful by the Faculty Committee and Dean of the School of Veterinary Medicine may be used in the selection process. The minimum acceptable grade-point average for an applicant to be considered for admission to the School is 2.5.

Since scholastic achievement, particularly in the required courses, is a very important criterion for admission to the School of Veterinary Medicine, you are cautioned to use the Passed/Not Passed option sparingly.

Work-experience with animals and a familiarity with the veterinary medical profession are considered significant factors in demonstrating motivation and a sincere interest in the profession. Comprehensive letters of evaluation are an important consideration in the review of an application.

In view of the demand from California residents for admission to the School of Veterinary Medicine — each year there are 5 to 6 applications from Californians for each of the 128 first-year openings — and since it is virtually impossible for a California resident to gain admission to a veterinary school elsewhere, it is the stated policy of the University that with only rare exceptions admission to the School is limited to California

residents. The criteria for determining residency are explained on page 313. Specific questions should be addressed to the Attorney-in-Residence Matters, 590 University Hall, University of California, Berkeley, CA 94720. No other persons are qualified to give rulings on residency. In cases where exceptions are made, first preference is given to residents of states participating in the Western Interstate Commission for Higher Education (WICHE). For this reason, an application form will be available only to California residents and individuals from WICHE states. Students residing in WICHE states that do not have a school of veterinary medicine and who wish to participate in this program must be certified by their home state. For the address of state certifying officers, write to the Western Interstate Commission for Higher Education, Post Office Drawer P, Boulder, CO 80302.

Men and women are considered on an equal basis. Socially and economically disadvantaged students are encouraged to apply.

DEGREES

Requirements for the Bachelor of Science Degree in Veterinary Science

Any student in the School of Veterinary Medicine who does not hold a baccalaureate degree, but has satisfactorily completed the first two years of the professional curriculum and has satisfied the general University requirements (see page 60), is eligible to receive a Bachelor of Science degree in Veterinary Science.

Requirements for the Doctor of Veterinary Medicine Degree

A candidate for the Doctor of Veterinary Medicine degree must comply with the following requirements:

- Fulfill the academic standards set forth by the Faculty of the School of Veterinary Medicine
- Possess good moral character
- 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)
- Maintain a grade-point average of 2.0 (C), computed on all courses taken in the School
- Satisfactorily complete all required work as determined by the Faculty of the School

The Master of Preventive Veterinary Medicine Degree

Applicants must hold the Doctor of Veterinary Medicine degree or equivalent degree from an accredited school of veterinary medicine, and be recommended for admission by the faculty committee in charge of the program. Candidates for the degree must satisfactorily complete in residence a minimum of 50 quarter units of approved course work. The program, consisting of a group of required core courses and optional electives,

is scheduled over a 12-month period beginning in August. *Admission is limited to the beginning date of the program each year.*

Specific fields of emphasis are epidemiology, medical statistics, and disease control and eradication. Program options are available for specialization in food hygiene, avian medical practice, and in other areas of preventive veterinary medicine. The program commences with five weeks of instruction in Elementary Statistics prior to the beginning of the Fall Quarter, and is completed after a 10-week period of research and field studies subsequent to the completion of the Spring Quarter.

Inquiries regarding the program should be directed to the Office of the Dean, School of Veterinary Medicine, University of California, Davis, CA 95616.

The Master of Science and Doctor of Philosophy Degrees

General information regarding these degrees will be found in the *Announcement of the Graduate Division*, which may be obtained from the Graduate Division at Davis. Additional detailed information may be obtained by writing the chairperson of the department in which you wish to study.



Majors and Courses

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, as well as enabling you to transfer from one campus or university to another without undue difficulty.

The way units of credit are assigned to courses is 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 for 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 inquire from the instructor about what the course will require in the way of outside reading, term papers, problem sets, field trips, and the like. These are not always spelled out completely in the General Catalog. By knowing the amount of work which will be required, you can plan your course-load more systematically and realistically.

COURSE DESIGNATIONS

The *Class Schedule and Room Directory*, available several weeks before the beginning of each quarter,

gives class hours and room numbers, as well as the most up-to-date information on registration and enrollment procedures. A supplement with changes to the General Catalog and *Class Schedule and Room Directory* is available near the time for enrollment each quarter.

In the course listings which follow, the quarter in which a course is intended to be given is shown as follows:*

- I. Fall Quarter (September to December)
- II. Winter Quarter (January to March)
- III. Spring Quarter (April to June)
- IV. Summer Quarter (July to September) for students in the School of Medicine only

When a course is listed to be offered in even-numbered years or odd-numbered years only, the year involved would be that in which the quarter occurs: e.g., Fall Quarter 1979 would be an odd-numbered year and Winter and Spring Quarters 1980 would be even-numbered years.

A series of course numbers followed by two or three letters (for example, Spanish 101A-101B-101C) is continued through three successive quarters, ordinarily from September to June. The first quarter course listed this way is generally 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 102A and 102B), the A course is *not* a prerequisite to B, unless it is specifically mentioned in the listing of prerequisites.

PREREQUISITES

Prerequisites for courses should be noted carefully; the responsibility for meeting these requirements rests mainly on the student. Certain classes are restricted to

*Courses in the School of Law:

- I. refers to Fall Semester (August - December)
- II. refers to Spring Semester (January - May)

a limited number of students, and therefore it is especially important that you fulfill the prerequisites by the time the class begins. Otherwise, you may be displaced by a student who does have the necessary prerequisites. If you can demonstrate that your preparation is equivalent to that specified by the prerequisites, the instructor may waive these requirements for you.

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.

Variable-Unit Courses (See below for enrollment procedures) are primarily student-designed and the amount of credit given varies:

- **92 (Internship) courses** enable individual students to obtain practical experience to complement their educational goals or to explore potential career interests and opportunities.
- **97T (Tutoring) and 97TC (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 (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 which cannot be accommodated within the formal course structure.

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., 1ATA-1ATB-1ATC, 31ATA, 31ATB.

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 (see below for enrollment procedures) for upper-division credit include:

- **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 prior to enrollment.
- **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.
- **197T (Tutoring) and 197TC (Tutoring in the**

*Picnic Day's the
one time when the
Aggie in every-
body comes out.
— Junior, History*





Community) are the upper-division counterparts of 97T and 97TC.

- **198 (Directed Group Study)** courses are the upper-division counterparts of course 98, and are for students judged to have adequate background in the subject proposed for study.
- **199 (Special Study for Advanced Undergraduates)** courses are the upper-division counterparts of course 99, and involve supervised independent study and research courses requiring adequate background in the subject proposed for study as well as prior completion of 84 units.

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.

Registration for Variable-Unit Courses

Registration in the above variable-unit courses (numbered 92, 97T, 97TC, 98, 99, 192, 194H, 197T, 197TC, 198, 199) must be approved by the chairperson of the department concerned in a proposal submitted by the instructor in charge. The subject matter in these courses must fall within the instructor's professional competence. These courses, unless otherwise noted, are graded on a Passed/Not Passed basis *only*. Under special circumstances, an instructor may request from the appropriate college or school Committee on Courses of Instruction approval to award letter grades

(except 92, 192 courses). The request must be submitted by the instructor within the first ten days of instruction of the quarter in which the course is offered. Such requests, however, are not automatically approved.

In *Special Study Courses* (numbered 99, 194H, 199), credit is limited to a total of five units per term.

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

GRADUATE COURSES

Courses **numbered 200-299** are open to students 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 variable-unit 299 and 299D courses is Satisfactory/Unsatisfactory.

PROFESSIONAL COURSES FOR TEACHERS

Courses **numbered 300-399** are teacher-training courses in the Department of Education and in other departments and are especially intended for teachers or prospective teachers.

OTHER PROFESSIONAL COURSES

Courses **numbered 400-499** are in departments and schools other than the Department of Education.

Note: Undergraduates should refer to their college's section regarding any restrictions on degree credit for courses in the 200, 300, or 400 series.

INDEPENDENT STUDY PROGRAM

Information:
752-2231

The Independent Study Program is intended to provide an opportunity for upper-division students to design and pursue a full quarter (12-15 units) of individual study in an area of their special interest.

Under the current system of numbering courses, a program qualifying as Independent Study will consist of one or more courses in the 190-199 series, adding up to a quarter's work. 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 therefore 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 definitely not to be considered as merely 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 dean of your college) and submit it to the Committee on Courses of Instruction either directly or through your dean's office.

Deadlines will be about two weeks prior to the final enrollment date in the quarter preceding the proposed independent study quarter (see the Calendar on page 6).

You must report the completion or termination of the project to the Committee on Courses of Instruction, which may request additional materials if they were provided for in the project proposal.

For further information contact the chairperson of the Committee on Courses of Instruction, c/o Academic Senate Office, in person or by phone.

INDIVIDUAL MAJOR PROGRAMS

Opportunities for interdisciplinary programs tailored to your own educational objectives are offered by the "Individual Major" in the Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science (see page 230).

INTERNSHIP PROGRAM

The objective of the Internship Program is to enable students to obtain practical educational experience which will complement and enhance the traditional educational process. An internship should aid individual students who wish to explore potential career opportunities and assist them in clarifying their personal and educational goals.

Students may undertake an internship by enrolling in a course numbered 92 or 192 under departmental listings. Course 192 requires a minimum of 84 units prior to enrollment. These courses are initiated by the student well in advance of enrollment by first obtaining a "Request for Approval of Internship for Academic Credit" form from the office handling the desired 92 or 192 course, and then making arrangements with a faculty sponsor who subsequently obtains the signature of the department chairperson. The student presents a copy of the approved request form to the Work-Learn and Career Planning and Placement Office on campus and enrolls for the course by Add card through the department involved. The deadline each quarter is the last day for adding courses to the study list. A maximum of 12 units of 92 and/or 192 courses may be counted toward the 180 units required for graduation.

EXTRA-SESSION COURSES

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 depart-

ment in partial fulfillment of the residence requirement for the bachelor's degree. Enrollment is with the consent of the instructor only.

SUMMER SESSION COURSES

If you are a regularly enrolled student or are planning to enroll for the Fall Quarter, you can receive credit toward the degree in Summer Session courses (see page 16 for more information).

It is also possible for students to 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 Registrar for evaluation.

CONCURRENT COURSES

Where classroom space permits and the instructor gives permission, enrollment may be granted to members of the community in regular courses offered on the Davis campus. Such work may be used for admission consideration and for degree recognition. See page 45 for more information.

UNIVERSITY EXTENSION COURSES

Simultaneous enrollment in resident courses and in Extension courses is permitted only with the approval of the dean of your college or school. Credits may also be earned, but previous authorization is necessary.

KEY TO FOOTNOTE SYMBOLS

The following symbols are used throughout the Majors and Courses section to indicate:

- * Not to be given 1980-81
- ¹ Absent on leave, 1980-81
- ² Absent on leave, Fall Quarter 1980 (semester for Law School)
- ³ Absent on leave, Winter Quarter 1981
- ⁴ Absent on leave, Spring Quarter 1981 (semester for Law School)
- ⁵ In residence at President's Office (Systemwide Administration)
- ⁶ In residence at another campus

The course offerings listed in this catalog are subject to change without notice. For more current quarter offerings, refer to the *Class Schedule and Room Directory* available in the UCD Bookstore.

Afro-American Studies

(College of Letters and Science)

Carl C. Jorgensen, Ph.D., Program Director
Program Office, 467 Kerr Hall (752-1548)

Committee in Charge

Carl C. Jorgensen, Ph.D. (*Sociology*), Committee Chairperson
Daniel J. Crowley, Ph.D. (*Anthropology, Art*)
Carl C. Mack, Jr., Ph.D. (*Afro-American Studies*)
David L. Olmsted, Ph.D. (*Anthropology*)
*Frederick J. Simoons, Ph.D. (*Geography*), Fall-Winter Quarters

Faculty

James R. King, Ph.D., Assistant Professor
Carl C. Mack, Jr., Ph.D., Assistant Professor
Lako Tongun, M.A., Lecturer

The Major Program

The Afro-American Studies Program provides the opportunity for interested students to pursue a thorough study of African-American people. The major program is discipline oriented with the object of focus the Afro-American culture. Special emphasis is on tracing the culture through the transmigration of African people from Africa throughout the Americas. The program requires students to work closely with a faculty member in pursuing work toward the Bachelor of Arts degree. In collaboration with faculty supervision, the student must select an area of emphasis to be approved by the Program's major adviser. (Guidelines in selecting an area of emphasis are provided below.)

Upon completion of this program, students will have the background courses needed for graduate work toward a teaching credential or to pursue work in any discipline requiring broad social-scientific preparation.

Afro-American Studies

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	36
Afro-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, 20; 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	40
A coordinated program of upper-division courses, selected and approved in consultation with the major adviser to include:	
Core courses: Afro-American Studies 101A, 101B, 105 or 120, 110	16
Additional upper-division units chosen to reflect the student's major emphasis	24
Total Units for the Major	76

Major Program Emphasis

The following areas of emphasis are offered as a guideline for students interested in majoring in Afro-American Studies.

Culture of Afro-Americans emphasis:
Anthropology 140; Afro-American Studies 107, 120, 121; History 177; Political Science 167.

African emphasis:
Anthropology 139A, 139B; Afro-American Studies 105, 106, 107; History 115A, 116; Political Science 134, 146.

The above areas of emphasis are not the only areas students may choose for the Afro-American Studies major. However, it should be noted that the major program must (a) be developed in consultation with an Afro-American Studies faculty member, and (b) approved by the Program's major adviser. Information regarding the above areas of emphasis may be obtained from the Afro-American Studies Office.

Related Upper Division Courses

Students who contemplate majoring in Afro-American Studies are advised that the following courses are offered by faculty members in other disciplines and focus on African and Afro-American people and their culture.
Anthropology 139A, 139B, 140, 153; Applied Behavioral Sciences 151, 152, 153, 159, 172; Art 150; Dramatic Art 155; Education 150A, 150B, 150C; English 179, 181; History 102O, 115A, 115B, 115C, 116, 177; Music 113B; Political Science 134, 138, 146, 151, 167, 176; Psychology 159; Sociology 107, 130.

Major Adviser. J. R. King (752-1886); C.C. Mack (752-1549).

Teaching Credential Subject Representative. See page 105 for the Teacher Education Program.

American History and Institutions. This University requirement can be satisfied by completion of Afro-American Studies 10, 100, 120, 121. (See also page 61.)

Courses in Afro-American Studies

Lower Division Courses

10. Introduction to Afro-American Studies (4) I, II. King. Lecture—4 hours. Introduction to a range of Afro-American Studies materials dealing with Black social, religious, economic, migratory, and political movements of the late nineteenth through the twentieth century.

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. Ethnic Studies (3) I, II. The Staff
Lecture—3 hours. The history, culture, philosophy, and current problems of groups considered ethnic minorities in the United States as viewed by the groups themselves.

101A. Introduction to Research in the Afro-American Community (4) I. Mack
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.

101B. Methodologies and Modes in Afro-American Studies (4) II. Mack
Seminar—4 hours. Prerequisite course 101A. A seminar which provides an opportunity to develop academic skills through research methods, using data applicable to Afro-American Studies. Problem solving approaches utilizing the Black experience will be examined.

101C. Contemporary Research in Afro-American Studies (2) III. Mack
Seminar—2 hours. Prerequisite: course 101B. Review of research methods. Required for majors in Afro-American Studies. Methods of reporting research into various aspects of Afro-American Studies. Emphasis on project organization and research design. Opportunity to share research experience.

105. Ancient African Civilization: Pre-Colonial Era (4) I. The Staff
Lecture—4 hours. Survey of the ancient empires of Egypt, Kush, Nubia, Ethiopia, Ghana, Mali, and Songhai. Historical interpretation of external influences and patterns of annexation during that period.

106. From Africa to the Americas (4) II. The Staff
Lecture—4 hours. An exploration of the dimensions of slave trade in the Americas.

Afro-American Studies; Agrarian Studies

107. African Cultural Heritage in the Americas (4) II. King
Lecture—4 hours. Prerequisite: course 106 or 110 or consent of instructor. Analysis of African cultural systems as they adapted to slavery system after their transfer to the Americas.

110. West African Social Organization (4) I. King
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. King
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) III. King
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.

197T. Tutoring in Afro-American Studies (1-5) I, II, III. The Staff (Chairperson in charge)
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. 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)
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. Directed reading and discussion of selected problems in Afro-American Studies. (P/NP grading only.)

Professional Course

300. Afro-American Studies for Teachers (4) III. Mack
Lecture—4 hours. Prerequisite: consent of instructor. Methods of establishing, organizing, and teaching Afro-American Studies. Designed for professional and pre-professional students who will be teaching Afro-American and/or ethnic studies in elementary and secondary schools.

Agrarian Studies

(College of Agricultural and Environmental Sciences)

The Major Program

Agrarian Studies is a multi-disciplinary program designed for students who seek the "broad-view" and are challenged by the scientific, philosophical, and cultural concepts important to an understanding of agriculture and its relationship to man. Through a purposeful integration of science and the humanities the major provides a sound general education important for effective leadership in agriculture and in many agriculturally or environmentally related aspects of business, government, international services, or teaching. Depth of understanding in your field of agricultural interest is achieved by the selection of specialized courses and in work experience that can be gained in programs offered by Bixby Work-Learn or the campus Work-Learn Center.

With appropriate selections of a field of emphasis and electives, you may also prepare for admission to graduate study or a professional school.

Agrarian Studies

B.S. Major Requirements:

Social Sciences and Humanities	40
Written and oral expression (see College requirement, page 70)	8
Cultural anthropology or geography (Anthropology 2 or Geography 2)	4

NOTE: For key to footnote symbols, see page 130.

Philosophy of biological sciences (Philosophy 10G or 10B)	4
Introduction to economics (Economics 1A)	5
Restricted Electives	19
Additional courses selected in consultation with adviser from a list† of restricted electives in 3 or more of the following fields: agricultural economics, American studies, anthropology, classics, economics, geography, history, languages,‡ political science, rhetoric, sociology.	
Natural Sciences	58
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Biochemistry (Biochemistry 101A, 101B) and/or upper division plant or animal physiology	6
Mathematics (Mathematics 16A plus either Mathematics 16B, 19, Agricultural Science and Management 150, Engineering 5, or Statistics 13)	6
Soil science (Soil Science 2)	4
Ecology (Plant Science 101 or Environmental Studies 100)	4
Biological sciences (Biological Sciences 1 plus Botany 2 or Zoology 2)	9-10
Restricted Electives	12-13
Additional courses in 2 or more fields of science fundamental to agricultural pursuits, e.g., biochemistry, botany, genetics, microbiology, nutrition, physiology, soils, water science, zoology.	
Agrarian Studies Emphasis	24
Perspectives in agriculture (Agrarian Studies 2, 188)	4
Agrarian themes in literature (English 174)	4
Geography of agriculture (Geography 142)	4
Food and culture (Food Science and Technology 20)	4
History of U.S. agriculture (History 188A, 188B)	8
Agricultural Specialization	34
Major field	18
Courses chosen to provide depth of understanding in one of the following or closely allied fields: animal sciences, food sciences, plant sciences, resource sciences.	
Minor field	12
Closely related courses in either the natural sciences (e.g., entomology, physiology, soil and water science, etc.) or the social sciences (e.g., agricultural economics, anthropology, geography, political science, etc.) chosen specifically to enhance understanding of agriculture in a scientific or a cultural context.	
(Agricultural internship strongly recommended.)	(0-4)
Unrestricted Electives	24-28
Total Units for the Major	180

Major Adviser. R. J. Romani (*Pomology*).

Courses in Agrarian Studies

Questions pertaining to the following courses should be directed to the instructor or to the Pomology Department, 1035 Wickson Hall.

Lower Division Course

2. Perspectives in Agriculture (3) II. Romani (*Pomology*)
Lecture—2 hours; discussion—1 hour; one Saturday field trip, one 2-hour evening session. Introduction to agrarian studies, presenting agriculture's vital role in past and current civilizations. A review of important relationships between agriculture and the natural and social sciences.

†Examples of typical programs in Agrarian Studies with suggested courses in these areas may be obtained from the major adviser through the College Office.

‡Proficiency in a foreign language is contributory to a general education and specifically useful to an understanding of various aspects of agriculture. Students specializing in the agricultural sciences are encouraged to choose French, German, Japanese, or Russian; those interested in agricultural heritage could well choose Greek or Latin; students preparing for international aspects of agriculture or "agribusiness" would have obvious choices based on geographical interests.

Upper Division Course

188. Special Topics in Agrarian Studies (1) III. Romani (*Pomology*)
Discussion—1 hour. Prerequisite: course 2 or consent of instructor; open to lower division students. Group study of special topics on the relationships between agriculture and the arts and sciences. May be repeated for credit.

Agricultural and Environmental Chemistry (A Graduate Group)

Cornelius S. Ough, D.Sc., Chairperson of the Group

Group Office, 101 Enology Building (752-0696)

Faculty

Includes members from various departments in the College of Agricultural and Environmental Sciences.

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. Detailed information regarding graduate study may be obtained by writing the Group Chairperson.

Graduate Advisers. See *Class Schedule and Room Directory*.

Related Courses. See Biochemistry 205; Environmental Toxicology 203, 220, 220L; Food Science and Technology 211, 250, 251; Soil Science 215; Viticulture and Enology 219.

Courses in Agricultural Chemistry

Graduate Courses

290. Seminar (1) I, II, III. The Staff (Ough in charge)
Seminar—1 hour. Selected topics in Agricultural Chemistry, presented by students. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Ough in charge)
Prerequisite: consent of instructor. The chemistry and biochemistry of foods, nutritional chemicals, pesticides, and other special topics as they apply to agricultural chemistry.

299. Research (1-12) I, II, III, summer. The Staff (Ough in charge)
Arrangements should be made well in advance with a member of the Group in Agricultural and Environmental Chemistry. (S/U grading only.)

Agricultural and Home Economics Education

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Applied Behavioral Sciences.

Major Programs and Graduate Study. See majors in Home Economics (page 229) and Agricultural Education (page 135); and page 99 for graduate study.

Teaching Credential Subject Representative. Secondary Teaching Credentials—J. G. Leising, 137 AOB-4 (Agriculture); B. G. Goldman, 149 AOB-4 (Home Economics). Community College Credentials—J. G. Leising, 137 AOB-4 (Agriculture).

Courses in Agricultural and Home Economics Education

Questions pertaining to the following courses should be directed to the instructor or the Department of Applied Behavioral Sciences, 119 AOB-4.

Lower Division Course

92. Internship (1-12) I, II, III. The Staff (Leising in charge)
Field placement—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.)

Upper Division Courses

100. Concepts in Education (2) I. Goldman, Leising
Lecture—2 hours; field observations. Prerequisite: upper division students. Examination of educational institutions. Implications for those entering careers in teaching. (Sect. 1, Agriculture; Sect. 2, Home Economics.)

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. Goldman
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.

***180. Consumer Education** (3) III. The Staff (Goldman in charge)
Lecture—3 hours. Prerequisite: Consumer Economics 141 or 142 or Consumer Science 100. Examination of values, decision-making processes, lifestyle needs of individuals and communities as a basis for teaching of consumer education in various subject areas at all age levels. Offered in odd-numbered years.

192. Internship (1-12) I, II, III. The Staff (Leising in charge)
Field placement—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 (Thompson 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.)

Professional Courses

300. Directed Field Experience in Teaching (2) II, III. Goldman, Leising
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. (Sect. 1, Agriculture; Sect. 2, Home Economics.) (P/NP grading only.)

301. Planning for Instructional Programs (3) II, Goldman; III, Leising
Lecture—3 hours. Prerequisite: courses 100, 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. (Sect. 1, Agriculture; Sect. 2, Home Economics.)

302. Teaching Methods in Education (2-3) III. Goldman, Leising
Lecture (1 hour minimum)-laboratory—4-7 hours. Prerequisite: courses 100, 300 and 301. Development of teaching strategies, with special emphasis on the designing of learning experiences, instructional execution, teaching aids. (Sect. 1, Agriculture—2 units; Sect. 2, Home Economics—2-3 units.)

306A. Field Experience with Future Farmers of America and Supervised Experience Programs (4) I, II, III. 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, II, III. 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, II. Goldman
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.

371. Instructional Materials and Procedure (1) II, III. The Staff (Leising in charge)
Individualized instruction—3 hours. Prerequisite: upper division or graduate standing. Directed study of the principles, performance and operating characteristics of machines and materials used in instructional presentations. Course will proceed through study of individualized instruction modules with students making use of laboratory facilities at their own convenience. (P/NP grading only.)

372. Visual Communication Production (1) II, III. The Staff (Leising in charge)
Individualized instruction—3 hours. Prerequisite: course 371 or consent of instructor. Directed study of techniques and procedures for preparing instructional materials. Course will proceed through study of individualized instruction modules with students making use of laboratory facilities at their own convenience. (P/NP grading only.)

373. Multi-Media Communication (1-3) III. The Staff (Goldman in charge)
Seminar—1 hour; laboratory—3-6 hours. Prerequisite: courses 371, 372. Development of multi-media instructional sequences for use in agriculture and home economics education.

***381. Family Life Education** (3) II. The Staff (Goldman in charge)
Lecture—3 hours. Prerequisite: upper division standing; courses on the family, sex education, and teaching methods recommended. Current topics in family life education. Review of selected research, resources, curriculum, teaching strategies, and interdisciplinary approaches to family life education at all age levels. Offered in even-numbered years.

390. Seminar: Issues in Agricultural and Home Economics Education (2) II, Goldman; III, Leising
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. (Sect. 1, Agriculture; Sect. 2, Home Economics.) (S/U grading only.)

and social environment through study of the agricultural, biological, physical, and social sciences. The major offers an option of two areas of specialization: (a) Agricultural Economics and (b) Managerial Economics.

The Agricultural Economics option is preprofessional, essentially preparation for continued study at the graduate level. The emphasis is on the theoretical aspects which lie behind decisions concerning production, marketing, use of resources, prices, and policy. Supplemental courses are offered in statistics, effects of governmental policy, rural appraisal, and related topics.

The Managerial Economics option, while considering the theoretical, deals more with the practical managerial problems. Emphasis is on the decision-making function of management, use of scientific management controls and organization, personnel policies, and procurement and marketing methods.

Both options prepare graduates for professional management positions in financial and research institutions not necessarily limited to agriculture.

Agricultural and Managerial Economics

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
Preparatory Subject Matter	44
Written and oral expression (see College requirement, page 70)	8
American History and Institutions†	8
Economic principles (Economics 1A-1B)	10
Accounting (Economics 11A-11B)	7
Statistics (Statistics 13 or Economics 12)	4-5
Mathematics including calculus	6
Depth Subject Matter††	47-49
Theory: Agricultural Economics 100A, 100B	8
Statistics: choose two from Agricultural Economics 106A, 106B, and 155	7-8
One of two options:	
(a) <i>Agricultural Economics</i> (Preprofessional)	33
Mathematics 16B	
Agricultural Economics 108	
Economics 101	
Additional upper division agricultural economics and economics‡	
(b) <i>Managerial Economics</i>	32
Agricultural Economics 18	
Restricted electives: choose 12 units from Agricultural Economics 112, 117, 136, 157, 171A-171B	
Choose 12 units from Agricultural Economics 108, 120, 130, 140, 145, 150; Consumer Economics 142; Economics 101, 121A, 121B, 135, 150A, 150B, 151A, 151B, 160, 161; Political Science 174, 188;	
AND 4 units from Agricultural Economics 190A-190B‡ or upper division Restricted Electives	
Breadth Subject Matter	32
Agricultural and environmental sciences (excluding agricultural economics, consumer economics, and applied behavioral sciences). Natural sciences (including mathematics beyond preparatory subject matter). Social sciences (excluding economics, history and philosophy).	
Required: 8 units in one area and 12 units in each of the other two.	

†Students Meeting the American History and Institutions requirement may substitute social sciences as interpreted under the Social Sciences Breadth Subject Matter requirement.
††Students graduating with this major are required to maintain at least a C average (2.0) in all upper division Agricultural Economics, Consumer Economics, and Economics courses taken at the University.
‡Agricultural Economics 190A-190B is required for students seeking Departmental Honors at graduation. Consult adviser for details.

Unrestricted Electives 55-58
Total Units for the Major 180

Recommended Courses
Students should contact departmental advisers for up-to-date lists of courses which are acceptable for the breadth subject matter requirement.

Major Adviser. J. H. Snyder (*Agricultural Economics*).

Information Center for the Major, 105 Voorhies Hall.

Graduate Study. See page 99.

Agricultural Economics

(College of Agricultural and Environmental Sciences)

Benjamin C. French, Ph.D., Chairperson of the Department

Department Office, 118 Voorhies Hall (752-1517)

Faculty

- John M. Antle, Ph.D., Assistant Professor
- Bayford D. Butler, Ph.D., Lecturer
- Hoy F. Carman, Ph.D., Professor
- Harold O. Carter, Ph.D., Professor
- Robert A. Collins, Ph.D., Assistant Professor
- James H. Cothorn, Ph.D., Lecturer
- D. Barton DeLoach, Ph.D., Professor Emeritus
- Peter H. Farquhar, Ph.D., Associate Professor (*Agricultural Economics; Graduate School of Administration*)
- Jerry Foytk, Ph.D., Professor
- Benjamin C. French, Ph.D., Professor
- Varden Fuller, Ph.D., Professor Emeritus
- B. Delworth Gardner, Ph.D., Professor
- Leon Garoyan, Ph.D., Lecturer
- Richard D. Green, Ph.D., Associate Professor
- David E. Hansen, Ph.D., Associate Professor
- Arthur Havenner, Ph.D., Associate Professor
- Trimble R. Hedges, Ph.D., Professor Emeritus
- Gerald L. Horner, Ph.D., Lecturer
- Richard E. Howitt, Ph.D., Associate Professor
- Stanley S. Johnson, Ph.D., Lecturer
- Warren E. Johnston, Ph.D., Professor
- Desmond A. Jolly, Ph.D., Lecturer
- Gordon A. King, Ph.D., Professor
- John E. Kushman, Ph.D., Associate Professor
- Sylvia Lane, Ph.D., Professor
- Elmer W. Learn, Ph.D., Professor
- Samuel H. Logan, Ph.D., Professor
- Philip L. Martin, Ph.D., Associate Professor
- Alexander F. McCalla, Ph.D., Professor (*Agricultural Economics; Graduate School of Administration*)
- Chester O. McCorkle, Jr., Ph.D., Professor
- Charles McGahan, LL.B., J.D., Lecturer
- Charles V. Moore, Ph.D., Lecturer
- Kent D. Olson, Ph.D., Lecturer
- Quirino Paris, Ph.D., Professor
- A. Doyle Reed, Ph.D., Lecturer
- Refugio I. Rochin, Ph.D., Associate Professor
- Lawrence E. Shepard, Ph.D., Associate Professor
- J. Herbert Snyder, Ph.D., Professor
- Stephen H. Sosnick, Ph.D., Professor
- Joe J. Stasulat, Ph.D., Lecturer
- James E. Wilen, Ph.D., Associate Professor (*Environmental Studies*)
- Barbara S. Zoloth, Ph.D., Assistant Professor

Major Program and Graduate Study. See the major in Agricultural and Managerial Economics (this page); and see page 99 for graduate study.

Major Advisers. See *Class Schedule and Room Directory*.

Agricultural and Managerial Economics

(College of Agricultural and Environmental Sciences)

The Major Program

Agricultural and Managerial Economics focuses on the student's understanding of the total economic

NOTE: For key to footnote symbols, see page 130.

Agricultural Economics

Related courses. See Environmental Planning and Management 110; Environmental Studies 160, 168A, 168B, 173; and courses in Consumer Economics and Economics.

Courses in Agricultural Economics

Lower Division Courses

*1. Economic Basis of the Agricultural Industry (4)

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.

18. Business Law (4) I, III. McGahan

Lecture—4 hours. Prerequisite: sophomore standing. Instruction in the background, history and procedure of law; introduction to business law in the field of contracts, business organization operation and termination, real property, employment and agency concepts; present applications by the courts and legislature. (P/NP grading only.)

49A., 49B., 49C. Field Practice (1) I, II, III, Stasulat

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)

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, Paris; II, Antle

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A, 1B; Mathematics 16A. 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. Students having had Economics 100 or the equivalent may not receive credit for this course; however, Economics 100 will not serve as prerequisite to course 100B.

100B. Intermediate Microeconomics: Imperfect Competition, Markets and Welfare Economics (4) II, French; III, Martin

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A. Pricing, output determination, and employment of resources under conditions of monopoly, oligopoly, and monopolistic competition.

103. Theory of Economic Optimization (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B; Mathematics 16A, 16B. Analytics of economic optimizing behavior for consumers and firms, using linear algebra, partial differentiation, quasi-concave functions, and the Kuhn-Tucker theorems. (Same course as Economics 103.)

106A. Quantitative Methods in Agricultural Economics (4) I, Green; II, Havener

Lecture—3 hours; discussion—1 hour. Prerequisite: Statistics 13. Statistical methods for analyzing quantitative agricultural economics data: descriptive statistics, probability, hypothesis testing, statistical inference, and sampling.

106B. Quantitative Methods in Agricultural Economics (4) II, Paris; III, Foytik

Lecture—3 hours; discussion—1 hour. Prerequisite: course 106A. Statistical methods for analyzing quantitative agricultural economics data: linear and multiple correlation and regression analysis.

108. Regional Analysis: Location and Trade (3) III, King

Lecture—3 hours. Prerequisite: course 100B. Theory of regional specialization, location, and trade for agricultural products; general economic equilibrium.

112. Fundamentals of Business Organization (4) I, III, McCorkle

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) II, Butler

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. Students having had course 136 may not receive credit for this course.

114. Production Management (4) II, Carman

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A; course 113 recommended. For non-majors only. Principles and procedures for efficient use of resources in processing and handling of agricultural and other products; work scheduling; inventory control; coordination of production and sales. Students having had course 157 may not receive credit for this course.

117. Managerial Accounting (4) II, III, Sosnick

Lecture—4 hours; field trip. Prerequisite: Economics 11B; course 112 recommended. Basic concepts of accounting as a managerial tool; procedures for financial reporting; systems and internal control; cost accounting; budgeting; interpretation of administrative reports.

120. Agricultural Policy (3) III, Carter

Lecture—3 hours. Analytical treatment of recent and current economic problems and governmental policies and programs affecting American agriculture.

125. Comparative Agriculture (4) I, Hansen

Lecture—4 hours. Agriculture on all continents and in the principal countries; resources, organization, and operation; productivity and earnings in the farm versus the non-farm sector, and development economics.

130. Agricultural Marketing (4) I, Cothorn; II, Garoyan

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A or the equivalent. The nature, function, organizational structure, and operation of agricultural markets; prices, costs, and margins; market information, regulation, and controls; cooperative marketing.

136. Managerial Marketing (4) II, Carman

Lecture—4 hours. Prerequisite: course 100A; Statistics 13. 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.

140. Farm Management (5) II, Reed; III, Olson

Lecture—5 hours; field trip. Farm organization and resources; economic and technological principles in decision making; analytical techniques and management control; problems in organizing and managing the farm business.

145. Farm and Rural Resources Appraisal (4) I, Reed; II, Johnston

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. Natural Resource Economics (4) I, Hansen

Lecture—3 hours; discussion—1 hour. 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 policy 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. Natural Resource Economics (2) I, Hansen

Lecture—3 hours; discussion—1 hour. 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 policy 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, Antle

Lecture—3 hours. 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 (3) I, Rochin

Lecture—2 hours; discussion—1 hour; field trip. Problems, attitudes, and characteristics of agricultural employers, employees, and labor contractors. Impact of mechanization; determinants of productivity; wage levels and structures; evolution and efficiency of the labor market; placement and supervision; off-season and in-season unemployment; organization and conflict; relevant legislation.

151. Economics of Poverty (3) II, Martin

Lecture—3 hours. Prerequisite: Economics 1A-1B or consent of instructor. Economic theories of mean distribution;

causes of poverty; economic analysis of and political prospects of policies to minimize economic insecurity, maximize equality of opportunity, and establish minimum income levels.

155. Quantitative Analysis for Business Decisions (3) II, Farquhar; III, Foytik

Lecture—3 hours. Prerequisite: Mathematics 16A; and course 106A. Introduction to selected topics in operations research, including mathematical programming, applied decision theory, game theory, and inventory models.

157. Analysis for Production Management (4) III, Logan

Lecture—4 hours. Prerequisite: courses 100A, 106A. 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 (3) I, Collins

Lecture—3 hours. Prerequisite: Economics 11A, 11B. Financial analysis at the firm level; methods of depreciation; influence of the tax structure; inventory, cash, and accounts receivable management; sources and short-term and long-term financing. Students who have had or are taking Economics 134 may not receive credit for this course.

171B. Financial Management of the Firm (3) II, Collins

Lecture—3 hours. Prerequisite: course 171A, Economics 11A, 11B. 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.

176. Economic Analysis in Resource Use (3) III, Gardner

Lecture—3 hours. Prerequisite: Economics 1A, 1B; course 100B or the equivalent recommended. An analytical treatment of resource use problems, including public policy issues; economic productivity and natural resources; determinants, principles and patterns of natural resource use; resource conservation; land tenure problems and policies.

190A. Senior Research Project (2) I, Snyder; II, Lane

Lecture—1 hour; discussion—1 hour. Prerequisite: courses 100A, 106A, 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. Courses 190A-190B required for students seeking departmental honors at graduation; consult adviser for details. (Deferred grading only, pending completion of sequence.)

190B. Senior Research Project (2) II, Snyder; III, Lane

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)

Laboratory—3-18 hours. Internship experienced 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: junior or senior standing and consent of instructor. Limited to students with adequate preparation in Agricultural Economics. (P/NP grading only.)

Graduate Courses

200A. Microeconomic Theory (5) II, Kushman

Lecture—4 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 103, Mathematics 16A-16B or consent of instructor. Theories of behavior of individual economic agents. Characteristics of market equilibrium in perfectly competitive, monopolistic, and monopsonistic markets. (Same course as Economics 200A.)

200B. Microeconomic Theory (5) III. The Staff (Child in charge)

Lecture—4 hours; discussion—1 hour. Prerequisite: course 200A or consent of instructor. Introduction to theorems of

welfare economics in a general equilibrium, linear economic models, externalities and market failure, social welfare functions. (Same course as Economics 200B.)

200C. Microeconomic Theory (4) I. The Staff (Child in charge)

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 200A, 200B. Further topics in microeconomics, including risk and uncertainty, capital theory, separability and aggregation, and other topics. (Same course as Economics 200C.)

204. Microeconomic Analysis (5) I.

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.)

***206. Applied Welfare Economics (3) II.**

Lecture—3 hours. Prerequisite: one graduate course in microeconomic theory; one course in econometrics (co-requisite); one intermediate course in welfare economics (Economics 130). Application of welfare economic theory to topics chosen from areas of human resources, natural resources, general welfare issues, and market performance. Focus on the techniques of welfare theory by illustrating alternative methodologies through specific empirical applications.

215A. Economic Development (4) I. Glassburner (Economics)

Discussion—1 hour; seminar—3 hours. Prerequisite: Bachelor's degree in Economics (or the equivalent) or consent of instructor. Theories of economic development as they relate to developing nations; demographic problems; distribution issues in economic development. (Same course as Economics 215A.)

215B. Macroeconomic Development (4) II. Kaneda (Economics)

Discussion—1 hour; seminar—3 hours. Prerequisite: course 215A. The macroeconomics of economic development; monetary policy problems; fiscal problems, international trade; specific country studies. (Same course as Economics 215B.)

215C. Economic Development in Agriculture: Policy and Planning (4) III. Hansen

Lecture—3 hours; discussion—1 hour. Prerequisite: course 215A or the equivalent. Agriculture in the structure of developing nations; its role in economic development; agriculture and national planning; sectorial policies relating to prices, inputs, productivity, and marketing; international aspects of trade, aid, and technical assistance; country case studies. (Same course as Economics 215C.)

215D. Development Programming (4) III. Kaneda (Economics)

Discussion—1 hour; seminar—3 hours. Prerequisite: courses 215A and 215B or 215C, 200B, Economics 200E. Analysis of development plans, programs and policies. Application of input-output, programming, and operations research. Techniques of project evaluation. (Same course as Economics 215D.)

221. Agricultural Policy in Developed Countries (3) III. McCalla

Lecture—3 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.

240A. Econometric Methods (4) III. Howitt

Lecture—4 hours. Prerequisite: Statistics 130B and a course in linear algebra. Statistical models and their use in estimation of economic relationships; single and multiple equation systems. (Same course as Economics 240A.)

240B. Advanced Econometrics: Theory (4) I. Havenner

Lecture—3 hours; discussion—1 hour. Prerequisite: course 240A; Statistics 131A, 131B, 131C recommended. Multivariate analysis, specification analysis, simultaneous equation models, identification, estimating methods, small sample properties. (Same course as Economics 240B.)

240C. Advanced Econometrics: Application (4) II. Green

Lecture—3 hours; discussion—1 hour. Prerequisite: course 240A. Time series analysis and distributed lags, pooling of time series and cross-section data, Bayesian analysis, applications for prediction and policy. (Same course as Economics 240C.)

252. Applied Linear Programming (4) I. Foytik

Lecture—3 hours; discussion—1 hour. Applied linear programming methods emphasizing uses for business deci-

sions: production, diet, blending, network and related problems.

253. Optimization Techniques with Economic Applications (4) II. Paris

Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 103. Optimization techniques and methods including linear and nonlinear programming and dynamic models. Numerical applications to household, firm, general equilibrium and economic growth problems.

254. Dynamic Optimization Techniques for Economic Systems with Applications (4) III. Howitt

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. Logan

Lecture—3 hours. Dynamic model formulation and computer simulation of economic systems.

256 Applied Econometrics (4) II. Havenner

Lecture—3 hours; discussion—1 hour. Application of statistical tools to economic and business analysis. Emphasis on regression analysis, problems of specification, and model development.

257. Production Planning and Market Analysis (3) II.

Lecture—3 hours. Quantitative analysis of production systems by statistical, economic, and engineering methods; sales analysis for the individual firm; problems of investment, location, scale of operations.

261. Case Problems in Management (3) III. McCorkie

Lecture—1 hour, discussion—2 hours. Case problem analysis and discussion of management functions including business strategy, management evaluation, financing, marketing and production, with emphasis on application of theory to problem definition and solution. (S/U grading only.)

262. Applied Problem Analysis (3) I, II, III, summer. The Staff (French in charge)

Field study—9 hours; research paper or case study. Students function individually or as a member of a team solving an economic analysis, planning or operating problem in a firm, agency or equivalent setting. (S/U grading only.)

271. Financial Management (3) III. Sosnick

Lecture—3 hours. Prerequisite: course 171B or the equivalent. Sources and costs of capital, optimal capital structure; project evaluation, investment policy, risk management, dividend policy, management of working capital; mergers and reorganizations.

280. Analysis of Research in Production Economics (4) I. Carter

Lecture—3 hours; discussion—1 hour. Current problems and methods of analysis in agricultural production economics research. Emphasizes both firm and industry.

281. Economic Analysis of Demand and Trade (3) II. King

Lecture—3 hours. Models and methods of analysis of demand, interregional trade, and location in the agricultural economy.

283. Analysis of Research in Natural Resource Economics (3) III. Wien

Lecture—3 hours. Scope and disciplinary context of natural resource economics. Recent problems affecting policy and use planning including efficiency and welfare criteria, technological externalities, public goods, extra market goods, indivisibilities, and intertemporal problems, benefit cost analysis and public and private investment criteria.

290. Advanced Research Development (1) I. King

Seminar—1 hour. Prerequisite: second-year Ph.D. standing. Seminar on current research problems and activities: selection, design, and manageability of research projects. (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

See Agricultural Education (below); and Agricultural and Home Economics Education

Agricultural Education

(College of Agricultural and Environmental Sciences)

The Major Program

The Agricultural Education major serves those interested in teaching agricultural sciences in high schools or junior colleges as well as those preparing for a service-type career in agriculture. It prepares graduates whose function will be to supervise youth and adult groups and to direct programs requiring preparation in both agricultural and human resources. State and federal requirements for instructors participating in federally funded vocational programs are also met. The need for scientists, technicians, and creative educators to assist in domestic and international agricultural programs has created a continuing demand for qualified instructors and supervisory personnel. This major also provides general preparation which is appropriate for work in banking, sales and service, rural recreation, and related agricultural industries. Students interested in obtaining breadth in both agricultural and environmental sciences will appreciate the scope and flexibility which this program provides.

Agricultural Education

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
Preparatory Subject Matter	42
Biological sciences (including genetics)	21
Chemistry (including organic)	15
Physics (choose from Physics 2A, 2B, or 2C)	6
Depth Subject Matter	65
Agricultural economics	9
Agricultural and Home Economics Education 100, 160	5
Agricultural engineering	11
Animal sciences	16
Environmental sciences (includes offerings in environmental horticulture, environmental studies, environmental toxicology, renewable natural resources, and wildlife and fisheries biology)	8
Plant and soil sciences	16
Breadth Subject Matter	33
English 1, 2, 3	12
Economics 1A or 1B	5
Social sciences and humanities electives †	16

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

NOTE: For key to footnote symbols, see page 130.

Restricted Electives to supplement or expand any of the above areas	14
Choose from the following: Entomology 110; Environmental Planning and Management 20; Nutrition 103; Plant Pathology 120; Water Science 110A, 110B.	
Unrestricted Electives	26
Total Units for the Major	180

Major Adviser. J. G. Leising (*Applied Behavioral Sciences*).

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 Applied Behavioral Sciences departmental office, 106 AOB-4. Since many majors in the College do not offer the minimum preparation necessary for entering the Agriculture Credential program, you are encouraged to seek counseling as early as possible. See also page 105 for the Teacher Education Program.

Graduate Study. The Department of Applied Behavioral Sciences offers a program of study leading to the M.Ed. degree. See also page 99. Further information may be obtained from the department and the *Announcement of the Graduate Division*.

Graduate Adviser. M. C. Regan.

Courses. See course listings under Agricultural and Home Economics Education (page 132) and Applied Behavioral Sciences (page 146).

Agricultural Engineering

(College of Agricultural and Environmental Sciences)

Roger E. Garrett, Ph.D., Chairperson of the Department

Department Office, 2030 Bainer Hall (752-0102)

Faculty

Norman B. Akesson, M.S., Professor
 Roy Bainer, M.S. LL.D., Professor Emeritus
 David E. Brune, Ph.D., Assistant Professor
 Paul A. Carroad, Ph.D., Assistant Professor
 William J. Chancellor, Ph.D., Professor
 Pictiaw (Paul) Chen, Ph.D., Professor
 John B. Dobie, M.S., Lecturer
 Roger E. Garrett, Ph.D., Professor
 John R. Goss, M.S., Professor
 George F. Hanna, M.Ed., Lecturer
 S. Milton Henderson, M.S., Sc.D., Professor Emeritus
 David J. Hills, Ph.D., Assistant Professor
 M. Stephen Kaminaka, Ph.D., Assistant Professor
 Robert A. Kepner, B.S., Professor
 Coby Lorenzen, Jr., M.S., Professor Emeritus
 John A. Miles, Ph.D., Assistant Professor
 George E. Miller, M.S., Lecturer
 Stanton R. Morrison, Ph.D., Professor
 Loren W. Neubauer, Ph.D., Professor Emeritus
 Michael O'Brien, Ph.D., Professor
 Thomas R. Rumsey, Ph.D., Assistant Professor
 R. Paul Singh, Ph.D., Associate Professor
 Henry E. Studer, M.S., Professor
 James F. Thompson, M.S., Lecturer
 Wesley E. Yates, M.S., Professor

Courses. See course listings under Agricultural Engineering Technology (this page), Consumer Technology (page 168), and Engineering: Agricultural (page 185).

Agricultural Engineering Technology

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Agricultural Engineering.

Major Programs and Graduate Study. For the Bachelor of Science major program see specializations under major in Engineering: Agricultural (pages 80-81); and see page 99 for graduate study.

Courses in Agricultural Engineering Technology

These courses are intended primarily for students not majoring in Engineering. Majors in Engineering should refer to courses in Agricultural Engineering on page 185. Questions pertaining to the following courses should be directed to the instructor or to the Department Office, 2030 Bainer Hall.

Lower Division Courses

98. Directed Group Study (1-5) I, II, III. The Staff (Garrett in charge)
 Prerequisite: consent of instructor. Group study of selected topics. Primarily for lower division students. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Garrett in charge)
 (P/NP grading only.)

Upper Division Courses

101. Fruit Production Mechanization (1) I. Studer
 Lecture—1 hour; two or three field trips. Prerequisite: upper division standing. Physics 2A, and general knowledge of fruit production. The relationship of orchard, vineyard, and small-fruit machinery to fruit production and quality; functions and capabilities; interrelationships between cultural practices and machine operation. (P/NP grading only.)

102. Farm Tractors (1) II. Yates
 Lecture—1 hour. Prerequisite: Physics 2A or high school physics recommended. Types of farm tractors: operating principles, including power transmission components, power-take-off drives, implement hitches and controls; traction and drawbar power; operator safety, comfort, and convenience. (Engines are studied in Consumer Technology 101.)

103. Hydraulic Power and Controls (1) II. Studer
 Lecture-laboratory—2 hours. Prerequisite: upper division standing; Physics 2A. Principles of operation and construction of hydraulic systems. Function and application of pumps, motors, and valves for controlling machines.

104. Field Machinery (2) III. Kepner
 Lecture—1 hour; laboratory—3 hours. Prerequisite: upper division standing; Physics 2A and some general knowledge of field crop production recommended. Principles, performance, and operating characteristics of machines for tillage, planting, cultivating, and harvesting field and vegetable crops. Laboratory may include one or more field trips, field studies, laboratory studies of specific machines, and lecture-discussions.

105. Machinery Management (1) III. Chancellor
 Lecture—1 hour. Prerequisite: course 101 or 102 or 104, or consent of instructor. Factors in machinery management decisions; sources of management information; methods of analyzing and selecting machinery systems; management of machinery maintenance; the role of machinery management with respect to worker safety.

113. Animal Environment and Shelters (1) III. Morrison
 Lecture—2 hours (last five weeks of quarter). Prerequisite: Animal Science 2 or consent of instructor. Animal energetics; heat and vapor transmission in buildings; psychrometrics; ventilation; hot-weather protection. Environmental considerations affecting the choice of animal shelter.

114. Plant Shelters, Environment and Related Equipment (1) III. Rumsey

Lecture—2 hours (first five weeks of quarter). Prerequisite: Plant Science 2, Botany 2, or consent of instructor. A study of shelters and equipment for providing a suitable environment for plant growth; temperature and humidity regulation; tillage and irrigation equipment for use in plant shelters.

121. Heat Transfer (2) I. Morrison
 Lecture—2 hours. Prerequisite: Physics 1B or 2B. Thermal radiation (including solar); convection; conduction; psychrometrics. Emphasis is on applications to processing, structures, and energy conservation.

132. Management of Agricultural Wastes (1) III. Hills
 Lecture—1 hour. Prerequisite: upper division standing; Physics 2B and Chemistry 1B recommended. Current methods of disposing of animal, plant, pesticide, food processing, and forest products wastes. Waste problems in relation to air, soil and water resources.

132L. Laboratory Studies in Management of Agricultural Wastes (1) III. Hills
 Laboratory—3 hours. Prerequisite: course 132 (concurrently). Directed laboratory exercises, field trips and special projects to augment the study of course 132. (P/NP grading only.)

133. Aircraft and Ground Equipment for Crop Protection, Nutrition and Vector Control (2) III. Akesson
 Lecture—2 hours. Prerequisite: Chemistry 1B; Physics 2B; upper division standing. Physical aspects of equipment and application techniques related to the effectiveness of agricultural chemicals and biological materials. Techniques for reducing hazards to people, crops, and wildlife.

133L. Laboratory for Equipment for Crop Protection (1) III. Akesson
 Laboratory—3 hours. Prerequisite: course 133 (concurrently). Directed laboratory exercises and field trips to augment study in course 133. (P/NP grading only.)

141. Technology for Agriculture in Developing Regions (2) I. Chancellor
 Lecture—1 hour; laboratory-discussion—2 hours. Prerequisite: Physics 1A. 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.)

151. Energy Relations in Agricultural Production (1) II. Chancellor
 Lecture—1 hour. Prerequisite: Physics 2B. Quantitative relationships among energy flows in various forms through agricultural production and processing as practiced in California today; the sun, plants, animals, fertilizers, irrigation, field machinery, pesticides, transportation, food preservation, distribution.

152. Energy Technology Applications in Agriculture (2) II. Goss, Hills, Rumsey
 Lecture—1 hour; laboratory—2 hours. Prerequisite: course 151 (may be taken concurrently), Chemistry 1B, Physics 2B. Technology for utilizing energy from the sun and wind, and from organic materials, via gasification and methane generation. Practical systems for collecting, transferring, converting, and applying energy for agricultural uses. Energy storage and conservation.

161A. Fundamentals of Aquacultural Engineering (3) II. Brune
 Lecture—2 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 and Mathematics 16B, or the equivalent. Application of engineering principles to aquaculture; physical-chemical aspects of aquatic environment; unit processes in aquaculture; fluid flow.

161B. Fundamentals of Aquacultural Engineering (3) III. Brune
 Lecture—2 hours; discussion—1 hour. Prerequisite: course 161A. Aquaculture system planning; techniques of large-scale algal culture; introduction to mathematical modeling of aquaculture systems.

198. Directed Group Study (1-5) I, II, III. The Staff (Garrett in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Garrett in charge)
 (P/NP grading only.)

Graduate Courses

298. Group Study (1-5) I, II, III. The Staff (Garrett in charge)

299. Research (1-12) I, II, III. The Staff (Garrett in charge)
 (S/U grading only.)

Professional Course

317. Problems in Teaching Farm Mechanics (3) II. O'Brien
Lecture—2 hours; laboratory—3 hours. Prerequisite: Physics 2A or 8A and consent of instructor. Demonstrations of and practice in the methods of teaching farm mechanics in secondary schools. School-shop planning, including selection, arrangement, and management of equipment, curriculum planning, including the relation of teaching materials, references, safety and visual aids.

Agricultural Practices

(College of Agricultural and Environmental Sciences)

Courses in Agricultural Practices

Questions pertaining to the following courses should be directed to the instructor or to the Office of the Department of Agricultural Engineering, 2030 Bainer Hall.

Lower Division Courses

49A. Field Equipment Operation (1) I, III. Hanna (Agricultural Engineering)
Laboratory—3 hours. Prerequisite: consent of instructor. Theory and operation of the major types of field equipment, wheel and track-type tractors used in agriculture, forestry, and natural resource management. Essentials of safe equipment operation, the fundamentals of preventive maintenance, field adjustments and trouble shooting are presented. (P/NP grading only.)

49B. Field Equipment Maintenance (1) II. Hanna (Agricultural Engineering)
Laboratory—3 hours. Prerequisite: consent of instructor. Theory of operation and maintenance principles for internal combustion engines, power trains, hydraulic and pneumatic controls. Introduction to arc and acetylene welding, the care and use of basic hand and shop tools. (P/NP grading only.)

Agricultural Science and Management

(College of Agricultural and Environmental Sciences)

The Major Program

The Agricultural Science and Management major is designed to provide the training required by business or industry to function in the management of the larger, more diverse agricultural operations. Students may specialize in one of three areas: *animal science*, *food science*, or *plant science*. Course work in biological, physical, social, and agricultural sciences with supporting courses in economics, business, and management permits individual flexibility.

Agricultural Science and Management

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirement are shown in parentheses. Equal or more comprehensive courses are acceptable.)

	UNITS
Preparatory Subject Matter	57-59
Biological sciences (including Biological Sciences 1; and two from Bacteriology 2, 3, Botany 2, or Zoology 2-2L)	14-16
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Economics (Economics 1A, 1B, 11A, 11B)	17
Mathematics (Agricultural Science and Management 150; Mathematics 16A)	7
Physics (Physics 1A or 1B)	3
Physics 1A required for Animal Science and Plant Science options; Physics 2A required for Food Science option.	
Breadth Subject Matter	18
English, written, English 1 or 2	4
English, oral, Rhetoric 1, 3, or Philosophy 5	4
Social sciences and humanities †	10
Common Core Courses	18-21
Agricultural Economics 100A, 140, plus three additional courses	18-21
Marketing, Agricultural Economics 113, 130, 136; finance, Agricultural Economics 117, 170A, 170B; quant methods, Agricultural Economics 155, 157; business organizations, Agricultural Economics 18, 112.	
Depth Subject Matter	50
Animal Science option	
Genetics 120, Animal Genetics 106	7
Nutrition 103	4
Physiology 110	5
Animal science	20
Choose one course from Animal Science 114, 115, 116, 118A, 118B, 140; and the balance from Animal Genetics 107, 108, 109; Animal Science 104, 105, 111, 117, 119, 123, 124, 127, 128, 129, 131, 141; Bacteriology 177, 177L; Nutrition 122, 123; Physiology 121, 130, 148; Environmental Planning and Management 111.	
Agricultural sciences	14
Courses to support student's objectives to be chosen from the following areas or others with the adviser's approval: agricultural engineering technology, agronomy, plant science, range management, soil science, water science.	
Food Science option	
Chemistry 1C, 5	9
Biochemistry 101A, 101B	6
Mathematics 16B	3
Physics 2B, 2C (omit Physics 1A)	6
Food science and technology	26
Upper division courses in food science and technology chosen to support student's objectives with the adviser's approval. Courses should include Food Science 103, 104, 104L, 110A, 110B.	
Plant Science option	
Botany 102 or 121; 111A, 111B	9
Entomology 110 or 112	4
Genetics 120	4
Plant Pathology 120	4
Plant Science 2	4
Soil Science 2, 2L, 109	8
Water Science 110A	3
Restricted electives	14
Choose courses from agricultural engineering technology, consumer technology, Engineering 5, upper division courses in agronomy, environmental horticulture, plant science, pomology, vegetable crops, and viticulture.	

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Unrestricted Electives 32-38

Total Units for the Major 180

Major Adviser. See *Class Schedule and Room Directory*.

Departmental Advising Center is located at 162 Animal Science Building.

Graduate Study. See page 99.

Courses in Agricultural Science and Management

Questions pertaining to the following courses should be directed to the instructor or to the Animal Science Advising Center.

Upper Division Courses

150. Applied Statistics in Agricultural Sciences (4) I, Geng (Agronomy and Range Science)
Lecture—3 hours; laboratory—3 hours. Prerequisite: at least two years high school algebra and junior standing. Applications of statistical methods to the analysis and interpretation of research data in plant, animal, behavioral, food and nutritional sciences. Lectures cover concepts and basic statistical theory. Specialized laboratory sections cover procedures, data processing and interpretations.

190. Proseminar in Agricultural Science and Management (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: upper division majors or consent of instructor. Reports and discussions of current development in the agricultural industry. (P/NP grading only.)

Agronomy

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Agronomy and Range Science.

Major Programs and Graduate Study. See majors in Plant Science (page 276) and Range and Wildlands Science (page 285); and page 99 for graduate study.

Related Courses See Plant Science and Range Management.

Courses in Agronomy

Questions pertaining to the following courses should be directed to the instructor or to the Academic Advising Center, 132 Hunt Hall.

Lower Division Courses

21. Agricultural Science and the Food Crisis (2) III. Rains
Lecture—2 hours. An interdisciplinary approach to the food issue. Lecturers will be drawn from several departments to discuss such areas as agronomy, nutrition, economics, water science, agricultural engineering, political science, and anthropology. Both agricultural and nonagricultural majors are encouraged to enroll.

92. Agronomy Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience 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

100. Principles of Agronomy (4) I, Rains; III, Travis
Lecture—3 hours; discussion-demonstration—1 hour. Prerequisite: a course in general botany and/or Plant Science 2 or consent of instructor. Fundamentals of field crop production and agronomic problem solving using ecological, physiological and genetic principles.

NOTE: For key to footnote symbols, see page 130.

100L. Principles of Agronomy Laboratory (1) I, Webster, III, Travis

Laboratory—3 hours. Prerequisite: course 100 (may be taken concurrently). Field-oriented introduction to principles of agronomic crop production.

111. Cereal Crops of the World (4) II, Schaller
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 100, 100L; Botany 2. Contribution of cereal crops to man's development; adaptation, production, utilization, and factors determining quality of wheat, oats, barley, rice, corn, and sorghum. Emphasis is on recent developments and scientific improvements.

112. Forage Crop Ecology (3) III, Raguse
Lecture—3 hours. Prerequisite: Botany 2 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, including pastures, rangelands and hay; aspects of forage quality which affect feeding value to livestock.

112L. Forage Crop Ecology Laboratory (1) III, Raguse
Laboratory—3 hours (includes four half-day field trips). Prerequisite: course 112. Greenhouse experiments and problem sets to supplement course 112. Field trips related to forage plant breeding, management, and utilization.

113. Fiber, Oil and Sugar Crops in a Changing World (4) I, Mikkelsen, Knowles, Hills
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 100, 100L; Botany 2. Industrial 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.

120. Morphology and Reproduction of Agronomic Crops (3) III, Webster
Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2 or the equivalent. Study of growth and development of crop plants with emphasis on reproductive structure and pollination, and techniques for morphological analysis.

192. Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience 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 (Qualset in charge)
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 (Qualset in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Qualset in charge)
Prerequisite: 6 upper division units of agronomy. (P/NP grading only.)

Graduate Courses

205A-205B. Design, Analysis and Interpretation of Experiments (3-3) II-III, Geng, Williams
Lecture—2 hours; discussion—1-2 hours. Prerequisite: graduate standing in Plant Science; Agricultural Science and Management 150; knowledge of elementary FORTRAN or ALGOL recommended. The planning and analysis of field and laboratory experiments with emphasis on the biological interpretation of results.

***210. Agricultural Research Planning and Management** (3) II, Peterson
Lecture—2 hours; discussion—2 hours; two full-day field trips. Prerequisite: graduate standing in any agricultural field of study and consent of instructor. An analysis of the problems of planning, managing, evaluating, and utilizing agricultural research to promote agricultural development.

221. Advanced Plant Breeding (4) III, Teuber
Lecture—3 hours; laboratory—3 hours. Prerequisite: Plant Science 113. Advanced topics in plant breeding. Genetic diversity and centers of origin of cultivated plants, mating systems in plants, polyploidy, host-pathogen relationships, role of mutagens in plant breeding, and other topics of current interest.

***222. Quantitative Genetics and Plant Improvement** (4) II, Allard
Lecture—4 hours. Prerequisite: Plant Science 113; Genetics 105; or consent of instructor. Genetic forces affecting

populations. Formulation of breeding plans based on principles of population and quantitative genetics. Offered in even-numbered years.

223. Selection Theory in Plant Breeding (3) II, Jain
Lecture—2 hours; discussion—1 hour. Prerequisite: course 222 or consent of instructor. 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 odd-numbered years.

224. Chromosome Evolution (4) I, Dvorak
Lecture—3 hours; laboratory—3 hours. Prerequisite: Genetics 101 or consent of instructor. Structure and function of chromosomes. Dynamics of their evolution at the molecular and structural levels.

225. Manipulation of Plant Chromosomes (3) I, Dvorak
Lecture—2 hours; laboratory—3 hours. Prerequisite: Genetics 100A, 100B or Genetics 120. Application of chromosome manipulation in plant genetics and plant physiology. Development and utilization of genetic tools in gene mapping, analysis of genetic architecture of plant genomes, and interspecific gene transfer.

230. Advanced Population Biology (3) II, Jain
Lecture—2 hours; discussion—1 hour. Prerequisite: Genetics 103; recommended — a basic course in ecology (Botany 117, Zoology 125, etc.). The dynamics of growth and evolution of populations. Genetic and ecological aspects of population regulation and integration. Natural selection within and among populations. Intra- and inter-specific competition. Community structure and diversity. Offered in even-numbered years.

231. Advanced Topics in the Ecology of Crop and Range Plant Communities (3) II, Laude
Lecture—3 hours. Prerequisite: Plant Science 101. Analysis and quantitative description of the structure and dynamics of field crop and range communities in relation to interplant competition, population functions, environmental stresses and adaptation.

232. Advanced Topics in the Physiology of Crop and Range Plants (3) I, Huffaker
Lecture—3 hours. Prerequisite: Botany 111B or Plant Science 102. Physiological aspects of vegetative and reproductive growth of field crop and range plants in relation to nitrogen utilization and photosynthesis.

233. Biological Nitrogen Fixation (3) II, Valentine
Lecture—2 hours; seminar—1 hour. Current concepts of the physiology, microbiology, biochemistry, genetics, and regulation of free-living and symbiotic N₂-fixing organisms. Integration and translation of basic research to develop strategies for improving N-productivity of agronomic crops.

290. Seminar in Crop Growth, Production and Utilization (1-2) I, Loomis, II, Mikkelsen
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) I, Schaller, III, Dvorak
Seminar—1-2 hours. Topics of current interest related to plant breeding systems and the origins of evolution of cultivated plants.

297T. Tutoring in Agronomy (1-5) I, II, III. The Staff (Qualset in charge)
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 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 (Qualset in charge)
Directed study in the areas of plant physiology, plant genetics, plant biochemistry, agricultural chemistry, or soil-plant relationships of field crops or range and pasture plants.

299. Research (1-12) I, II, III. The Staff (Qualset in charge)
Original research involving plant physiology, plant genetics, plant biochemistry, agricultural chemistry, or soil-plant relationships of field crops. (SU grading only.)

Agronomy and Range Science

(College of Agricultural and Environmental Sciences)

Calvin O. Qualset, Ph.D., Chairperson of the Department

Department Office, 133 Hunt Hall (752-1703)

Faculty

- Robert W. Allard, Ph.D., Professor (*Agronomy and Range Science, Genetics*)
- Benjamin H. Beard, Ph.D., Lecturer
- R. William Breidenbach, Ph.D., Lecturer
- John P. Conrad, Ph.D., Professor Emeritus
- Beecher Crampton, M.S., Senior Lecturer
- Jan Dvorak, Ph.D., Associate Professor
- Ken W. Foster, Ph.D., Assistant Professor
- Shu Geng, Ph.D., Associate Professor
- F. Jack Hills, Ph.D., Lecturer
- Ray C. Huffaker, Ph.D., Professor
- Subodh K. Jain, Ph.D., Professor
- Milton B. Jones, Ph.D., Lecturer
- Paulden F. Knowles, Ph.D., Professor
- Horton M. Laude, Ph.D., Professor
- William M. Longhurst, Ph.D., Professor Emeritus
- Robert S. Loomis, Ph.D., Professor
- R. Merton Love, Ph.D., Professor Emeritus
- John W. Menke, Ph.D., Assistant Professor
- Duane S. Mikkelsen, Ph.D., Professor
- Maurice L. Peterson, Ph.D., Professor
- Donald A. Phillips, Ph.D., Associate Professor
- Calvin O. Qualset, Ph.D., Professor
- Charles A. Raguse, Ph.D., Professor
- D. William Rains, Ph.D., Professor
- Paul L. Rowell, Ph.D., Lecturer
- J. Neil Rutger, Ph.D., Lecturer
- Charles W. Schaller, Ph.D., Professor
- Donald E. Seaman, Ph.D., Lecturer
- Ernest H. Stamford, Ph.D., Professor Emeritus
- Larry R. Teuber, Ph.D., Assistant Professor
- Robert L. Travis, Ph.D., Associate Professor
- Carl L. Tucker, M.S., Lecturer
- Ray C. Valentine, Ph.D., Professor
- Barbara D. Webster, Ph.D., Professor
- William A. Williams, Ph.D., Professor
- Frederick P. Zscheile, Jr., Ph.D., Professor Emeritus

Courses. See course listings under Agronomy (page 137) and Range Management (page 286).

American Studies

(College of Letters and Science)

Jay Mechling, Ph.D., Program Chairperson
Program Office, 816 Sproul Hall (752-3377)

Committee in Charge

- ³David A. Robertson, Ph.D. (*English*), Committee Chairperson, Fall, Spring Quarters
- W. Jeffrey Weidner, Ph.D. (*Animal Physiology*), Committee Chairperson, Winter Quarter
- Daniel H. Calhoun, Ph.D. (*History*)
- Stephen C. Jett, Ph.D. (*Geography*)
- Jay Mechling, Ph.D. (*American Studies*)
- ^{3,4}Larry I. Peterman, Ph.D. (*Political Science*), Fall Quarter
- David Scofield Wilson, Ph.D. (*American Studies*)
- ²Marvin Zetterbaum, Ph.D. (*Political Science*), Winter-Spring Quarters

Faculty

Jay Mechling, Ph.D., Associate Professor
 Merline A. Williams, M.A., Lecturer
 David Scofield Wilson, Ph.D., Associate Professor

The Major Program

Students who choose American Studies are usually those who feel too limited by a narrow, departmental approach to American experience. The American Studies major is interdepartmental, providing the student the opportunity to combine courses from the natural sciences, social sciences, and humanities. The seven core courses, taught by the American Studies faculty, pay special attention to theoretical and methodological issues and practices central to interdisciplinary study. This is the shared work all American Studies students do together in relatively small classes, combining classroom and field studies. Students also design an individual course of study (another eleven or twelve courses) around their own special interests. Some may choose to design an individual emphasis around an area like American literature or American history, others may choose an interdisciplinary subject like women's studies, regional studies, popular culture studies, or the fine arts, and others choose to emphasize cross-cultural studies. Because each student's American Studies major is individualized, it is important to contact an adviser early and to continue to work closely with your adviser throughout your program.

Career Alternatives. As an interdisciplinary major, American Studies provides a good liberal arts and sciences undergraduate education. American Studies maximizes the student's contact with a variety of subject matter and approaches. This flexibility has meant that our majors 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 our program of internships in American institutions.

American Studies

A.B. Major Requirements:

Preparatory Subject Matter	UNITS
At least one course from American Studies	
1A, 1D, 1E, 1F, 30	4
American Studies 45	4
Courses which provide an understanding of theories of (a) culture, (b) American History and (c) social structure and processes such as would be expected with successful completion of Anthropology 2, History 17A, 17B, Sociology 1, or appropriate equivalents	16
Depth Subject Matter	60-64
American Studies 110, 140A, 140B, 140C	
190A, 190B, 190C	28
Upper division course work from one of the following three emphases	20
(a) 20 units of course work in a single department, concentrating on American culture (e.g., anthropology or literature or history or sociology).	
(b) 20 units of course work focusing on a single cultural problem or theme (e.g., bureaucratization, urban studies, the arts, science and culture, religion and culture, education).	
(c) 8 units of course work in a culture or subculture selected as the subject of cross-cultural study (see below) plus 12 units of further study in the data of American culture (see below).	

- Course work from two of the following three options 12-16
- (a) 12 units of cross-cultural study beyond American Studies 110.
 - (b) 12 units of supplementary theory and methods courses chosen from a list available in the American Studies Office.
 - (c) 16 units of courses in the data of American culture chosen from a list available in the American Studies Office.

Total Units for the Major 84-88

Recommended

Lower division: courses chosen in consultation with a major adviser in preparation for (a) the upper division emphasis and (b) upper division cross-cultural study, as well as (c) courses in the natural sciences, social sciences, and humanities which meet the College Area Requirement and at the same time contribute clearly to the study of American culture (e.g., Biological Sciences 10, English 30A, 30B, 30C, Psychology 1).

Upper division: courses in the unused option from above. Since the core of interdisciplinary courses, i.e., American Studies 45, 110, 140A, 140B, 190A, 190C, is taken in sequence during the junior and senior years, integration of courses satisfying the above, requires careful and advanced planning. Students pursuing a teaching credential especially need to plan early in order to meet program, College, and State requirements.

Minor Program Requirements:

American Studies	UNITS
American Studies, upper division courses	20
No more than 8 units of course 192 may be counted toward this total.	

Major Advisers. J. Mechling, M. A. Williams, D. S. Wilson.

Teaching Credential Subject Representative. J. Mechling. See page 105 for the Teacher Education Program.

Courses in American Studies

Lower Division Courses

1A. Technology, Science and American Culture (4) II. Mechling
 Lecture—2 hours; discussion—2 hours. Critical examination of American science and technology as cultural systems which define the natural world and man's relation to it; mutual influence and interaction of those systems and other cultural systems (arts, politics, social thought, religion, etc.).

***1D. Tradition and Revolution in American Culture** (4) III. The Staff
 Lecture—3 hours; discussion—1 hour. Critical examination of characteristic patterns of tradition and revolution in American culture, past and present: emphasis on continuities and relationships, in the arts, communities, ideologies, literature, politics, radical movements, religion, etc.

1E. Nature and Culture in America (4) I, Wilson
 Lecture—3 hours; discussion—1 hour. Studies of nature in America; Indian and non-Indian approaches to nature contrasted; attention to institutions and individuals (artists, scientists, naturalists, farmers, etc.); survival theory and practice; classwork, field study, directed independent projects, individual or collective.

1F. The Popular Image of Women in America (4) I, III, Williams
 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 female image and the demands of the larger American culture.

2. Forms of American Wisdom (2) I, Wilson
 Lecture—1 hour; discussion—1 hour. An exploration of the forms wisdom takes in America — e.g., folk knowledge, prophetic scriptures, public religion, science — with attention to coming to terms today with its content. (P/NP grading only.)

***30. Fieldwork in American Civilization** (4) III. The Staff
 Lecture—2 hours; fieldwork—2 hours; evaluation of written, visual, and aural field reports and conferences with individual students. A practical introduction to the multi-disciplinary

techniques of gathering, organizing, and interpreting the data of American experience; exercises in participant observation, interviewing, above-ground archaeology, photographic anthropology, and in the application of these techniques to the study of a literate, post-industrial civilization.

45. Introduction to American Studies (4) I, III, Williams, Wilson
 Lecture—2 hours; discussion—2 hours; evaluation of written reports and conferences with individual students. Prerequisite: at least one course from course 1 sequence; Anthropology 2 and Sociology 1 or the equivalent. The elements of American Studies, including the background and general nature of American Studies, and the methods and philosophies of the academic disciplines which deal with the United States.

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. Introduction to Cross-Cultural Studies (4) II. Mechling
 Lecture—3 hours; short papers, tutorial conferences, archival exercises. Prerequisite: course 45. Similarities and differences between (1) American culture and foreign cultures, and (2) comparable elements in American culture (subcultures, value systems, etc.); theories, research methods and problems, representative models and importance of cross-cultural comparison and contrast; historical and nonhistorical approaches.

111. Sacramento Valley Studies (4) III. Wilson
 Lecture—2 hours; discussion—1 hour; fieldwork. Prerequisite: course 1 or 45 or Anthropology 2 recommended, or consent of instructor. A comparative study of the American cultures in the Sacramento River Valley, including their relationship to a shared biological, physical, social environment, their intercultural relations, and their relationships to the dominant American culture.

120. American Folklore and Folklife (4) III. Mechling
 Lecture—3 hours; fieldwork—1 hour. The theory and method of the study of American folk traditions, including oral lore, customs, music, and material folk culture (arts, crafts, architecture, costume, food). Emphasis upon the collection, classification, and analysis of California and urban folk traditions.

140A. Events and Institutions in American Culture (4) II. Mechling
 Lecture—3 hours; reports and tutorial conferences. Prerequisite: course 45. Study of a selected, limited period in the history of American culture, focusing on events and institutions, multidisciplinary but integrated for the purpose of comprehending the period's character and meaning. Emphasis on quantitative theory and methods.

140B. Value and Meaning in American Culture (4) III. Wilson
 Lecture—3 hours; reports and tutorial conferences. Prerequisite: course 45. Study of a selected, limited period in the history of American culture, approached thematically, multidisciplinary but integrated for the purpose of comprehending the period's character and meaning. Emphasis on qualitative theory and methods.

***140C. Problems in American Culture** (4) I, Williams
 Lecture—3 hours; reports and tutorial conferences. Prerequisite: courses 45, 140A, 140B. Multi- and interdisciplinary analysis in depth of a selected problem in American culture. Emphasis on the selection and application of appropriate concepts, methods, and techniques.

190A-190B-190C. Senior Proseminar (4-4-4) I-II-III. The Staff (Chairperson in charge)
 Seminar—3 hours: individual conferences and written report evaluations. Prerequisite: consent of Chairperson of

NOTE: For key to footnote symbols, see page 130.

Anatomy; Animal Behavior

American Studies Program. Individual research on American Studies topics. (Deferred grading only, pending completion of sequence.)

192. Internship in American Institutions (1-15) I, II, III. The Staff (Chairperson in charge)

Prerequisite: enrollment dependent on availability of intern positions, with priority to American Studies majors and those completing course 30. 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 15 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 (below); and Human Anatomy (under Medicine, School of)

Anatomy

(School of Veterinary Medicine)

George H. Cardinet III, D.V.M., Ph.D., Chairperson of the Department

Department Office, 1321 Haring Hall (752-1174)

Faculty

George H. Cardinet III, D.V.M., Ph.D., Professor
Leslie J. Faulkin, Jr., Ph.D., Associate Professor

Dallas M. Hyde, Ph.D., Assistant Professor

Logan M. Julian, D.V.M., Ph.D., Professor

Ralph L. Kitchell, D.V.M., Ph.D., Professor

Carleton L. Lohse, D.V.M., Ph.D., Associate Professor

Charles G. Plopper, Ph.D., Assistant Professor

Walter S. Tyler, D.V.M., Ph.D., Professor

Courses in Anatomy

Upper Division Courses

100. Systematic Anatomy (4) I, Julian

Lecture—2 hours; laboratory—6 hours. Prerequisite: Zoology 2, 2L. Lectures, dissections, and demonstrations emphasizing the typical structure of the anatomical systems of the dog, chicken, and subhuman primate.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Laboratory—6-15 hours. 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. Advanced Systematic Anatomy (5) II, Julian

Lecture—2 hours; laboratory—9 hours. Prerequisite: course 100 or consent of instructor. Detailed dissections comparing the anatomy of the dog, sheep, chicken and primate. Emphasis placed on the unique aspects of each species and their use in research.

202. Organology (2) II. The Staff (Julian 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 even numbered years.

205. Ultramicroscopic Anatomy (3) I. The Staff (Tyler 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.

206. Morphology of Body Surfaces (2) III. The Staff (Tyler in charge)

Lecture—1 hour; discussion—1 hour. Information concerning the three-dimensional morphology of internal and external body surfaces, both normal and abnormal, as revealed by scanning electron microscopy of cells, tissues, organs, and replicas will be compared and correlated with that derived from other techniques. Offered in even-numbered years.

207. Perspectives in Morphological Research (3) III. The Staff (Tyler 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 sterology, computer analysis of images, scanning and transmission electron microscopy, histochemistry, autoradiography, rapid freezing, and vascular injections. Offered in odd-numbered years.

***210. Principles of Histochemistry** (3) I. The Staff (Tyler in charge)

Lecture—2 hours; laboratory—3 hours. Prerequisite: Zoology 107, Biochemistry 101A. Principles of enzyme histochemistry of animal tissues applicable to light and electron microscopy. Offered in odd-numbered years. (S/U grading only.)

215. Veterinary Histology (6) II. The Staff (Faulkin in charge)

Lecture—3 hours; laboratory—9 hours. Prerequisite: Zoology 2-2L. The microscopic anatomy of tissues and organs of mammalian and avian species of veterinary significance.

283. Tumor Biology (3) I, Faulkin, Cardiff, Benjamini, Goldman, Manning, Theilen, Troy

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 odd-numbered years.

290. Seminar (1) I. The Staff

Seminar—1 hour. (S/U grading only.)

297. Advanced Group Study in Surgical Anatomy (2-4) I, II, III, Lohse

Laboratory—6-12 hours. Prerequisite: Veterinary Medicine 107 or consent of instructor. Selected topics in topographical, radiological, or regional anatomy as they apply to the clinical sciences.

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.)

Anesthesiology

See Medicine, School of

Animal Behavior (A Graduate Group)

Peter S. Rodman, Ph.D., Chairperson of the Group
Group Office, 328 Young Hall (752-0745/1988)

Faculty

The Group includes faculty from eight departments in three schools and colleges.

Graduate Study. The Graduate Group in Animal Behavior offers the Ph.D. degree with a specialization in one of three areas: (1) ethology and the evolutionary basis of animal behavior, (2) physiological basis of animal behavior, and (3) behavior of domestic animals. All specializations will emphasize the adaptive and evolutionary basis of animal behavior.

Preparation. Appropriate preparation is a bachelor's or master's degree in one of the several disciplines relevant to behavior such as psychology, zoology, anthropology, physiology, wildlife biology, ecology, veterinary science, 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 100A, 100B, or the equivalent

Statistics: Statistics 13, or the equivalent

Evolution: Genetics 103 or Zoology 148, or the equivalent

Animal behavior: Psychology 150 or Zoology 155, or the equivalent

Breadth Requirement. The following core courses or the equivalent are required of all students.

Systemic physiology: Physiology 110-110L or Zoology 142-142L (7 units)

Statistical analysis: Psychology 207 or

Agronomy 205A-205B (4-6 units)

Scientific approaches to animal behavior

research: Animal Behavior 201 (3 units)

Seminar in animal behavior: Animal Behavior

290 (1-3 units)

Ecology: Entomology 104, Environmental

Studies 100, or Zoology 125 (3-4 units)

College teaching: Biological Sciences 210

(2 units)

Comparative psychology: Psychology 250

(4 units)

Specialization. In addition to the requirements listed above, students must also take several courses in one of the three areas of specialization with substitution as approved by the adviser.

Graduate Adviser. E. O. Price (Animal Science).

Courses in Animal Behavior

Graduate Courses

201. Scientific Approaches to Animal Behavior Research (3) I. The Staff (Chairperson in charge).

Lecture—3 hours. Prerequisite: graduate standing and consent of instructor in charge. Philosophical issues, goals, strategies and tools in field and laboratory research.

***220. Behavioral Aspects of Animal Domestication** (3) III. Price (Animal Science) in charge, Hart (Physiological Sciences), Lott (Wildlife and Fisheries Biology)

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 even-numbered years.

290. Seminar in Animal Behavior (1-3) I, II, III. The Staff (Chairperson in charge)

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 (Chairperson in charge)
Prerequisite: graduate standing or consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. Advanced research in one of the specialty areas in animal behavior. (S/U grading only.)

Animal Biochemistry

See Biochemistry; and Biochemistry and Biophysics

Animal Genetics

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Animal Science.

Major Program. See major in Genetics (page 215).

Related Courses. See Agronomy 221, 222, 223; Plant Pathology 215; Plant Science 113; Vegetable Crops 220.

Courses in Animal Genetics

Questions pertaining to the following courses should be directed to the instructor or to the Animal Science Advising Center, 162 Animal Science Building.

Upper Division Courses

106. Population Genetics and Animal Breeding (3) III. Gall
Lecture—3 hours. Prerequisite: Genetics 120; one course in statistics recommended. Treatment of the principles of population genetics as they apply to artificial and natural populations. Stress on the application of single-gene Mendelian theory to animal breeding and genetics. Lectures will develop an appreciation of the utility of the theory and prepare students for more advanced study.

107. Genetics and Animal Breeding (4) III. Bradford
Lecture—3 hours; discussion—1 hour. Prerequisite: course 106 or the equivalent. Integrated view of population and quantitative genetics as they pertain to animal breeding. Course content restricted to basic principles defining mating systems and selection methods with current examples presented where possible. Emphasis given to those characters important to the production of food and the expression of these characters in livestock and poultry.

108. Methods in Quantitative Animal Breeding (3) II. Kennedy
Lecture—3 hours. Prerequisite: course 107. Methods and procedures in quantitative animal breeding: repeatability, heritability and genetic correlation estimation; single and multiple trait selection methods.

***109. Mammalian Genetics Laboratory** (2) I. Bradford
Lecture—1 hour; laboratory—2 hours. Prerequisite: course 107 (may be taken concurrently); consent of instructor. Experiments in qualitative and quantitative genetics using the laboratory mouse. Segregation; linkage; evaluation of effects of inbreeding, selection and maternal influence on different kinds of traits.

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.)

NOTE: For key to footnote symbols, see page 130.

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—2 hours; lecture/discussion—1 hour. Prerequisite: course 107 or the equivalent. Introduce the theoretical basis of quantitative genetics and the consequences of Mendelian inheritance. The course will develop the concepts used to estimate quantitative genetic differences and basis for partitioning the phenotypic variance.

206. Advanced Domestic Animal Breeding (3) III.
Lecture—3 hours. Prerequisite: course 107; 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 odd-numbered years.

***207. Quantitative Genetics and Animal Breeding Theory** (3) II. Abplanalp (Avian Sciences)
Lecture—2 hours; laboratory—2 hours. Prerequisite: Statistics 105A-105B or 130A-130B. Quantitative genetic theory, relating to inbreeding and crossbreeding systems, selection for cross performance, major quantitative genes, control populations, is developed and applied to the planning of breeding programs.

208. Estimation of Genetic Parameters (3) III. Kennedy
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. Specific emphasis is given to procedures applicable to livestock populations under selection. Offered in even-numbered years.

250. Animal Improvement in an International Context (4) III. Bradford
Lecture—3 hours; seminar—1 hour. Prerequisite: completion of at least one year of graduate study, including upper division or graduate courses in livestock production and animal breeding. Evaluation, utilization, conservation and exchange of animal germ plasm resources; exploitation of heterosis; improvement schemes in the absence of central data processing; population structure and rate of improvement; roles of governments; group breeding schemes; research needs. (S/U grading only.) Offered in odd-numbered years.

298. Group Study (1-5) I, II, III. The Staff (Bradford 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 Nutrition

See Nutrition

Animal Physiology

(College of Agricultural and Environmental Sciences)

Dorothy E. Woolley, Ph.D., Chairperson of the Department

Department Office, 192 Briggs Hall (752-0203)

Faculty

R. Leland Baldwin, Ph.D., Professor (*Animal Science*)
Marylynn S. Barkley, Ph.D., Assistant Professor
James M. Boda, Ph.D., Professor

Ray E. Burger, Ph.D., Professor
Harry W. Colvin, Jr., Ph.D., Professor
Perry T. Cupps, Ph.D., Professor (*Animal Science*)

J. Warren Evans, Ph.D., Associate Professor (*Animal Science*)

Jack M. Goldberg, Ph.D., Assistant Professor
John M. Horowitz, Jr., Ph.D., Professor
Barbara A. Horwitz, Ph.D., Professor
Frederick W. Lorenz, Ph.D., Professor Emeritus
Verne E. Mendel, Ph.D., Professor (*Animal Science*)

Gary P. Moberg, Ph.D., Associate Professor (*Animal Science*)

Frank X. Ogasawara, Ph.D., Professor (*Avian Sciences*)

Edward A. Rhode, Ph.D., Professor
Arnold J. Sillman, Ph.D., Associate Professor
Arthur H. Smith, Ph.D., Professor
W. Jeffrey Weidner, Ph.D., Assistant Professor
Barry W. Wilson, Ph.D., Professor (*Avian Sciences*)

Charles M. Winget, Ph.D., Lecturer
Dorothy E. Woolley, Ph.D., Professor

Courses. See course listing under Physiology (Animal), page 273.

Animal Science

(College of Agricultural and Environmental Sciences)

R. Leland Baldwin, Jr., Ph.D., Chairperson of the Department

Department Office, 130 Animal Science (752-1250)

Faculty

Gary B. Anderson, Ph.D., Associate Professor
C. Robert Ashmore, Ph.D., Professor
R. Leland Baldwin, Jr., Ph.D., Professor
Donald L. Bath, Ph.D., Lecturer
Paul R. Bowser, Ph.D., Lecturer
G. Eric Bradford, Ph.D., Professor
Anthony C. Bywater, Ph.D., Assistant Professor
C. Christopher Calvert, Ph.D., Assistant Professor

Floyd D. Carroll, Ph.D., Professor Emeritus
Ernest S. Chang, Ph.D., Assistant Professor
Wallis H. Clark, Jr., Ph.D., Professor
Douglas E. Conklin, Ph.D., Lecturer
Perry T. Cupps, Ph.D., Professor

Edward J. DePeters, Ph.D., Assistant Professor
Serge Doroshov, Ph.D., Associate Professor
J. Warren Evans, Ph.D., Professor
Graham A. E. Gall, Ph.D., Professor
William N. Garrett, Ph.D., Professor
Paul W. Gregory, Sc.D., Professor Emeritus
Dennis Hedgecock, Ph.D., Lecturer
Hubert Heitman, Jr., Ph.D., Professor
J. L. Hull, M.S., Lecturer

Brian W. Kennedy, Ph.D., Associate Professor
Robert C. Laben, Ph.D., Professor
Oskar Lang, Dip., Vet. Med. Vienna, Lecturer
Glen P. Lofgreen, Ph.D., Professor Emeritus
Joan M. Macy, Ph.D., Assistant Professor
Verne E. Mendel, Ph.D., Professor (*Animal Science, Animal Physiology*)

James H. Meyer, Ph.D., Professor
Gary P. Moberg, Ph.D., Associate Professor
James G. Morris, Ph.D., Professor
Edward O. Price, Ph.D., Professor
Michael J. Prokop, Ph.D., Assistant Professor
David W. Robinson, Ph.D., Professor
Wade C. Rollins, Ph.D., Professor Emeritus
Nathan E. Smith, Ph.D., Associate Professor
Donald T. Torell, M.S., Lecturer
William C. Weir, Ph.D., Professor (*Animal Science, Nutrition*)

The Major Program

Animal Science is the study of domestic animal resource utilization through the integration of natural and social sciences such as genetics, biochemistry, physiology, nutrition and economics. Emphasis may be placed on scientific, production, and management aspects of dairy or livestock production, aquaculture, or animals for work, recreation or laboratory purposes.

This major leads to career opportunities in the areas of production animal agriculture; management and sales in the service industries; agricultural extension, consulting, teaching, journalism or laboratory technology. *Pre-veterinary medicine* and preparation for other professional schools or graduate study may be achieved by careful planning in the major.

Animal 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
Preparatory Subject Matter	43-44
General biological sciences (including Biological Sciences 1, Zoology 2-2L, and either Bacteriology 2-3 or Botany 2)	15-16
Physical sciences, 16 units of chemistry (including BA-8B) and 9 units of mathematics, including statistics	25
Animal science (Animal Science 2)	3
Depth Subject Matter	55-56
Physiological Sciences 101A-101B or Biochemistry 101A-101B	6-7
Genetics (Genetics 120, Animal Genetics 106)	7
Nutrition (Nutrition 110 and 121; or 103 and either 122 or 123)	7
Physiology (Physiology 110, 110L)	7
Animal science, a minimum of 28 units	28
Select at least <i>two courses</i> from Animal Science 114, 115, 116, 140; and <i>seven courses</i> from Animal Science 104, 105, 111, 117, 119, 123, 124, 127, 128, 129, 131, 141; Bacteriology 177; Animal Genetics 107, 108, 109; Physiology 121, 130, 148; Nutrition 122, 123; Epidemiology and Preventive Medicine 111.	
Breadth Subject Matter	20
Written and oral expression (see College requirement, page 70)	8
Additional social sciences and humanities†	12
Unrestricted Electives	60-62
Selected by the student according to individual interests and objectives. Advisers will provide lists of recommended courses and will assist in the selection therefrom.	
Total Units for the Major	180

Major Adviser. R.C. Laben.

Departmental Advising Center, 162 Animal Science Building. 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. Detailed information may be obtained by contacting the graduate adviser. See also page 99.

Graduate Adviser. H. Heitman.

Related Courses. See Food Science and Technology 120.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Courses in Animal Science

Lower Division Courses

1. Domestic Animals and Man (3) I. The Staff
Lecture—2 hours; laboratory—3 hours. Animal domestication and factors affecting their characteristics and distribution. Animal use by man for food, work, fiber, drugs, research and recreation; present and future roles in society. Laboratory exercises with beef and dairy cattle, poultry, sheep, swine, laboratory animals, fish, and horses.

2. Introductory Animal Science (3) III. Anderson
Lecture—2 hours; laboratory—2 hours. Prerequisite: course 1 and Biological Sciences 1 recommended. Growth, reproduction, lactation, inheritance, nutrition, and disease control in domesticated animals; the application of sciences to animal production.

21. Livestock and Dairy Cattle Judging (2) II, III. The Staff
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) II-I. The Staff
Laboratory—6 hours; weekend field trips. Prerequisite: course 21. The 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.)

24. Introductory Aquaculture (3) III. Clark
Lecture—3 hours. Prerequisite: Biological Sciences 1. Aquatic animal production with particular reference to growth, reproduction, inheritance, nutrition and disease.

***27. Quantitative Skills for Animal Science** (3) I.
Lecture—2 hours; laboratory—2 hours. Prerequisite: two years of high school algebra; course 1 or the equivalent (may be taken concurrently) recommended. To introduce application of mathematics to animal science problems. Basic mathematical and statistical methods. Laboratory will involve student in solving actual problems using computer. This course will be prerequisite for Animal Science 127.

31A. Perspectives in Animal Science (1) I, Bywater
Lecture—1 hour. Consideration of the broad scope of opportunities in Animal Science and related fields and assessment of information on basic ingredients for a successful career. Of special interest to students new to the campus. (P/NP grading only.)

31B. Current Topics in Animal Science (1) II. Bywater
Lecture—1 hour, occasional discussion. Lectures, assigned reading and discussion of topics of current concern in the broad area of animal science. Topics may include land utilization; livestock, poultry and game production; nutritional, genetic, physiological and health management. (P/NP grading only.)

31C. Prospects in Animal Science (1) III. The Staff
Lecture—1 hour, occasional discussion. Examination of factors which may influence future relationships between man and other animals; competition for food, space and environment; animal and animal product analogs. (P/NP grading only.)

49A-49B-49C. Animal Management Practices (2-2-2) I-II-III. The Staff (Heitman in charge)
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, 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)
Laboratory: 3-18 hours. Prerequisite: consent of instructor. Work-learn experience 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.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Baldwin in charge)
Prerequisite: consent of instructor. Problems in animal biology; nutrition, breeding, and physiology of livestock. (P/NP grading only.)

Upper Division Courses

104. Principles of Domestic Animal Behavior (3) I, Price
Lecture—3 hours. Prerequisite: Biological Sciences 1 or Zoology 2 or the equivalent. To examine the basic principles of animal behavior as applied to domesticated species. Emphasis will be placed on the behavioral development and social behavior. External (exogenous) and physiological mechanisms influencing behavior will be discussed.

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.

105L. Behavioral Adaptations of Domestic Animals Laboratory (2) II. Price
Laboratory—3 hours, plus 3 hours to be arranged. Prerequisite: to be taken concurrently with or following course 105. To provide a research experience investigating the behavior of selected domestic animal species. Methods of data collection and analysis will be discussed.

111. Meats and Meat Animal Evaluation (2) I, Carroll
Laboratory—6 hours. Prerequisite: course 2 or 21. Correlation of live meat animal conformation and degree of finish with carcass traits, yield of red meat, criteria for grading carcasses and indicators of meat palatability.

114. Dairy Cattle Production (4) III. Laben, Kennedy
Lecture—3 hours; laboratory—3 hours. Prerequisite: Animal Genetics 107. Recommended: Nutrition 103 or 110 and course 124, or the equivalent. Scientific principles from genetics, nutrition, physiology and related fields applied to conversion of animal feed to human food through dairy animals. Genetic, environmental, and managerial sources of variation in milk composition and yield; economic and energetic efficiency of milk production.

115. Horse Production (4) I, Evans
Lecture—3 hours; laboratory—3 hours. Prerequisite: Genetics 120; Nutrition 103 or 110; Physiology 110. Feeding, breeding, and management of horses; application of the principles of basic animal sciences to problems of production of all classes of horses.

116. Meat Animal Production (4) III. Garrett
Lecture—3 hours; laboratory—3 hours. Prerequisite: Animal Genetics 107; Nutrition 103 or 110; Physiology 110. Application of the sciences of nutrition, physiology, and genetics to the development of efficient management programs for beef, sheep, and swine production. Similarities and differences among these species affecting management practices. Methods of improving carcass and meat quality.

***117. Physiological Aspects of Animal Production in Tropical and Arid Areas** (3) II. Morris
Lecture—3 hours. Prerequisite: a course in nutrition; Physiology 110. Comparative aspects of animal production from domesticated and wild species in tropical and arid environments, with emphasis upon the effects of the climatic and nutritional environment on basic physiological mechanisms as they relate to the efficiency of animal production.

118A. Range Livestock Production (3) I, Carroll, Torell
Lecture—3 hours. Prerequisite: Nutrition 103 or 110; courses 1, 2, and Genetics 120 or Animal Genetics 106 recommended. Application of scientific knowledge to the improvement and production of beef cattle and sheep. Reproduction including artificial insemination; breeding plans; management; supplementary feeding; marketing.

118B. Intensive Livestock Production (3) II. Heitman, Laben, Prokop
Lecture—3 hours. Prerequisite: Nutrition 103 or 110; courses 1, 2, and 118A, Genetics 120 or Animal Genetics 106 recommended. Principles and practices involved in feedlot, dairy, and swine operations. Growth and fattening; lactation; feeding practices; methods of evaluating body composition of meat animals; housing and equipment; waste disposal.

119. Theory and Practice of Aquaculture (15) I, Chang
Lecture—4 hours; discussion—1 hour; laboratory—30 hours. Prerequisite: upper division standing in a biological discipline with background in physiology, genetics and biochemistry; introductory aquaculture course (e.g., courses 24, 121) strongly recommended; application forms available in Animal Science Advising Center. In-depth study at the Bodega Marine Laboratory, integrating trends and history of aquaculture with experimental principles from genetics, nutrition, pathology, physiology and related fields as applied to practical aspects involved with culture of aquatic species with food production potential.

123. Animal Growth (4) II. Garrett, Ashmore, Gail
Lecture—2 hours; special reports and discussions—2 hours. Prerequisite: upper division course in genetics, physiology and nutrition or the equivalent background knowledge. Basic and practical aspects of prenatal, postnatal and adult growth of animals focusing on nutritional, physiological, and genetic effects and interrelationships. An unconventional approach will integrate knowledge from the several disciplines on the major factors regulating and influencing growth.

124. Lactation (4) II. Baldwin, Laben
Lecture—3 hours; laboratory—3 hours. Prerequisite: Physiology 110 and 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.

***127. Application of Mathematical Concepts to Animal Science** (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 16A or consent of instructor. Applications of mathematical concepts, computers and system simulation techniques in the solution of animal science related problems. Topics include mathematical modeling, systems analysis and linear programming. Examples are drawn from animal nutrition, physiology and management. (P/NP grading only.)

128. Linear Programming in Animal Agriculture (2) III. Bywater

Lecture—1 hour; discussion—1 hour. Prerequisite: intended for seniors with an understanding of animal production and of nutrition at least equivalent to Nutrition 103 or 110. A non-theoretical treatment of the use of linear programming and its applications in animal agriculture emphasizing farm planning and ration formulation. Intended to provide hands-on experience in developing and applying linear programs. (P/NP grading only.)

129. Animal Science Laboratory (4) I, Ashmore

Lecture—2 hours; laboratory—6 hours. Prerequisite: one course each in biochemistry, physiology, and nutrition. Introduction and opportunity for experience in laboratory methods commonly applied in animal science research, including experimental design, nutrition, whole animal, tissue, cellular, and sub-cellular analytical techniques; feed analyses, product evaluation, and statistical analyses of data. Preference to seniors in Animal Science.

131. Reproduction and Early Development in Aquatic Animals (4) II. Doroshov

Lecture—3 hours; laboratory—3 hours. Prerequisites: Zoology 100; 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.

140. Management of Laboratory Animals (3) I, Moberg, Lang

Lecture—2 hours; laboratory—3 hours. Prerequisite: Genetics 120 or Animal Genetics 106; Nutrition 103 or 110; Physiology 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. Management of Nonhuman Primates (3) III. Moberg

Lecture—2 hours; laboratory—3 hours. Prerequisite: Physiology 110 and consent of instructor. Examination of current husbandry practices used to maintain primates in zoos, breeding colonies, and laboratories. The application of concepts of basic sciences to problems in reproduction, behavior, environmental stress, and health will be discussed. Enrollment priority to Animal Science majors. Offered in odd-numbered years.

190. Proseminar in Animal Science (1) I. The Staff

Seminar—1 hour. Prerequisite: senior standing in Animal Science or consent of instructor. Reports and discussions of recent advances in animal science.

192. Internship in Animal Science (1-12) I, II, III. The Staff (Department Chairperson in charge)

Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience 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.)

197T. Tutoring in Animal Science (1-2) I, II, III. The Staff (Baldwin in charge)

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 (Baldwin in charge)

Prerequisite: consent of instructor. Selected topics relating to the animal sciences. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Baldwin in charge)

Prerequisite: consent of instructor. Problems in animal biology related to nutrition, breeding and physiology of large domestic livestock. (P/NP grading only.)

Graduate Courses

205. Computer Analysis of Biological Data (3) II. Kennedy
Lecture—3 hours. Prerequisite: Agricultural Science and Management 150. The use of matrix algebra, regression and least squares programs to manipulate and analyze balanced and unbalanced biological data. Lectures will be concerned with the analytical procedures used in the programs as well as interpretation of computer output.

290. Seminar (1) I, II, III. The Staff (Baldwin 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.)

297. Supervised Teaching in Animal Science (2) I, II, III. The Staff (Baldwin 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 (Baldwin in charge)
Prerequisite: consent of instructor. Lectures and discussions of advanced topics in the animal sciences. (Sect. 1, 2, 3 — letter grading; from Sect. 4 on — S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Baldwin in charge)
(S/U grading only.)

Anthropology

(College of Letters and Science)

William G. Davis, Ph.D., Chairperson of the Department

Department Office, 328 Young Hall
(752-0745/0746)

Faculty

Edwin B. Almirol, Ph.D., Assistant Professor
(*Applied Behavioral Sciences*)

Martin A. Baumhoff, Ph.D., Professor
David J. Boyd, Ph.D., Assistant Professor

Jay B. Crain, Ph.D., Assistant Professor in Residence
(*Psychiatry*)

Daniel J. Crowley, Ph.D., Professor
(*Anthropology, Art*)

Richard T. Curley, Ph.D., Associate Professor
William G. Davis, Ph.D., Associate Professor
Jack D. Forbes, Ph.D., Professor
(*Anthropology, Applied Behavioral Sciences*)

Byron J. Good, Ph.D., Assistant Professor in Residence
(*Psychiatry, Family Practice*)

Suad Joseph, Ph.D., Assistant Professor
Henry McHenry, Ph.D., Associate Professor

David L. Olmsted, Ph.D., Professor
Benjamin S. Orlove, Ph.D., Associate Professor
(*Environmental Studies*)

Peter S. Rodman, Ph.D., Associate Professor
David G. Smith, Ph.D., Assistant Professor

Lenora Timm, Ph.D., Assistant Professor
(*Linguistics*)

Delbert L. True, Ph.D., Professor
Carolyn F. Wall, Ph.D., Associate Professor

Miriam J. Wells, Ph.D., Assistant Professor
(*Applied Behavioral Sciences*)

The Major Program

Anthropology is a broad and diverse field with many subdisciplines, subdivided here at Davis into four categories — physical, social/cultural, linguistics, and archaeology. The goals for the Anthropology major are to train students for graduate study leading toward professional careers in anthropology and to provide background resources for teaching in primary and secondary education.

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, linguistics (language in culture and society with an emphasis on linguistic field methods), and archaeology (pre-history and the techniques and methods of archaeology) should enroll in the Bachelor of Arts degree program.

Anthropology

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	20-38
Anthropology 1, 2, 3	12
Anthropology 13 or Statistics 13	4
Geography 1 or Environmental Studies 10	4
Foreign language (18 units or the equivalent)	0-18
Depth Subject Matter	44
Anthropology 102, 103A, 109, 110, 128	20
Anthropology, one course from 111, 112, 120	4
Physical 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 150, 151, Genetics 100A, 100B, 115	8
Total Units for the Major	64-82

Anthropology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	47-59
Anthropology 1, 2, 3, 5	16
Biological Sciences 1	5
Chemistry 1A, 1B	10
Statistics 13	4
Zoology 2, 2L	6
Chemistry 8A-8B or Mathematics 16A-16B	6
Foreign language (12 units or the equivalent)	0-12
Depth Subject Matter	45
Six courses in anthropology, including at least 3 in physical anthropology, and the remaining 3 chosen in consultation with major adviser	23-24
Genetics 103, and 115 or 100A-100B or 120	7-9
Additional units from the list below to achieve a minimum of 45 upper division units. Include at least one laboratory course in human or vertebrate anatomy.	
Total Units for the Major	92-104

Recommended

Geology 1, 1L, 3, 3L; Physics 2A, 2B, 2C; Psychology.

Bachelor of Science List of Courses

Physical anthropology: 150, 151, 152, 153A, 153B, 154A, 154B, 155, 156, 157.

Upper division courses outside the Department: Anatomy 100; Biochemistry 101A, 101B; Botany 140; Epidemiology and Preventive Medicine 103A, 103B, 103C; Genetics 100A, 100B, 103, 105, 115, 120; Geology 106, 107; Human Anatomy 101; Physiology 110, 110L, 111A, 111B, 112, 113, 114; Psychology 108, 112, 150, 180; Zoology 100, 105, 106, 107, 125, 136, 147, 148, 155.

Major Advisers. D.J. Boyd, W.G. Davis, S. Joseph, (A.B. degree); H. McHenry, D.G. Smith. (B.S. degree).

Minor Program Requirements:

	UNITS
General Anthropology	24
Anthropology 120	4
One course from Anthropology 151, 152, 153A, 153B, 154A, 154B, 156, 157	4
One course from Anthropology 103A, 103C, 103D, 103E, 103F	4
One course from Anthropology 105A, 105B, 106, 108, 139A, 139B, 140, 143, 146, 147A, 147B, 148A, 148B, 190, 191, 192	4

NOTE: For key to footnote symbols, see page 130.

Anthropology

One course from Anthropology 102, 114, 116, 119B, 121, 122, 123, 124, 125, 126, 127, 128, 130, 141, 142, 162, 163 4
One additional course from any upper division Anthropology courses 4

Biological Anthropology 19-20
Anthropology 152, 153A, 154A 12
Two additional upper division Anthropology courses chosen in consultation with B.S. degree undergraduate adviser 7-8

Social-Cultural Anthropology 19-20
Anthropology 102 4
One course from Anthropology 105A, 105B, 106, 139A, 139B, 140, 143, 146, 147A, 147B, 148A, 148B, 190, 191, 192 4
Two courses from Anthropology 101, 119A, 119B, 120, 121, 122, 123, 124, 125, 126, 127, 128, 130, 141, 163 8
One additional upper division Anthropology course chosen in consultation with A.B. degree undergraduate adviser 3-4

Teaching Credential Subject Representative See page 105 for 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 the Graduate Division.

Graduate Advisers. C.F. Wall.

Related Courses. See Native American Studies 20.

Courses in Anthropology

Lower Division Courses

1. Physical Anthropology (4) I, McHenry; II, Rodman; III, Smith
Lecture—3 hours; discussion—1 hour. Introduction to human evolution. The 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.

2. Cultural Anthropology (4) I, Davis; II, Davis; III, Curley
Lecture—3 hours; discussion—1 hour. Diversity of cultures considered from the aspects of language, economics, kinship, art, magic, and religion: culture change.

3. Introduction to Archaeology (4) I, True
Lecture—3 hours; discussion—1 hour. Development of archaeology as an anthropological study; objectives and methods of modern archaeology.

***4. Introduction to Linguistic Anthropology** (4) III, Wall
Lecture—3 hours; discussion—1 hour. Language in its interrelationships with biology, culture, and society.

5. Proseminar in Biological Anthropology (4) III.
Seminar—4 hours; research 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 on the evolution of man's adaptations to the environment. (P/NP grading only.)

13. Quantitative Method in Anthropology (4) II, Baumhoff
Lecture—3 hours; discussion—1 hour.

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. Principles of Human Ecology (4) II, Davis
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 or 10 and Sociology 1 or Anthropology 2 recommended. An examination of the critical variables in the processes that relate man to his 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.)

102. Theory in Social and Cultural Anthropology (4) I, Boyd
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. An introduction to varieties of explanation in anthropology; discussion of controversy surrounding relations between the designation of problem areas, choice of concepts, and selection of facts in the construction of anthropological theory.

103A. Archaeological Theory and Method (4) II, True
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1, 3, and 13. Theory and method of prehistoric archaeology.

103C. New World Prehistory: The First Arrivals (4) III, True
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Early man in the New World. Cultural adaptation and development of early hunting and gathering peoples in North and South America.

103D. New World Prehistory: Archaic Adaptations in New World Prehistory (4) I.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The collectors: cultural diversification in post Pleistocene settings.

103E. New World Prehistory: Formative Lifeways in North and South America (4) III, Baumhoff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The farmers; the transition from a hunting and gathering subsistence to sedentary farming in the American Southwest, Mississippi Valley, and Andean South America.

103F. New World Prehistory — The High Cultures: Mesoamerican and Andean South America (4) III, Baumhoff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Urban developments and the rise of civilization in Mexico and Peru.

104. Race and Sex: Race Mixture and Mixed Populations (4) I, Forbes
Lecture—3 hours; discussion—1 hour. A study of the phenomena of race mixture (miscegenation), interracial marriage, and mixed (hybrid) human populations. Emphasis will be placed upon the social and cultural effects of race mixture and of the interaction of racism and sexual behavior.

***105A. Indians of North America** (4) III, Forbes
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. An introductory survey of the Indians of North America: origins, languages, civilizations, and history.

***105B. Indians of South America** (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. An introductory survey of the Indians and South America: origins, languages, civilizations, and history.

***106. Native Peoples of California and the Great Basin** (4) I, Forbes
Lecture—3 hours; discussion—1 hour. An introduction to the traditional and recent cultures of the American Indian peoples of the California-Great Basin area. Considerable emphasis will be placed upon the changes in those cultures taking place during the past 400 years.

***107A. Old World Prehistory** (4) II, The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The beginnings and development of cultural phenomena during the Pleistocene epoch. A critical and comprehensive survey of known cultural phenomena beginning some 2 million years ago and extending through the terminal stages of the last glacial period. Will include material from Africa, Asia and Europe.

***107B. Old World Prehistory** (4) II, Baumhoff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The first farmers. Development of a new way of life following the end of the Pleistocene. A critical and comprehensive survey of cultural developments during the period of time from the end of the Pleistocene through Neolithic times in Africa, Asia and Europe.

***107C. Old World Prehistory** (4) II, Baumhoff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The development of civilization. Bronze and iron age cultures in Africa, Asia and Europe. A survey of the archaeological evidence underlying currently accepted models relating to urban developments and the growth of civilization.

108. Native Americans in Contemporary Society (4) II, Forbes
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. An introduction to 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.

109. Phonetics (4) I, Wall
Lecture—3 hours; discussion—1 hour. Thorough grounding in articulatory phonetics with some attention to the fundamentals of acoustic phonetics. (Same course as Linguistics 109.)

110. Elementary Linguistic Analysis (4) III, Olmsted
Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. An introduction to phonemic theory, morphophonemics, morphemics, and tactics. (Same course as Linguistics 110.)

111. Intermediate Linguistic Analysis (4) III, Olmsted
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Continuation of course 110. Advanced work in phonemics, morphophonemics, morphemics, and tactics. (Same course as Linguistics 111.)

112. Comparative Linguistics (4) I, Olmsted
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Linguistic prehistory, historical linguistics, and reconstruction. (Same course as Linguistics 112.)

114. The Ethnography of Speaking (4) I, Wall
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2; course 4 or Linguistics 1. The social and linguistic aspects of verbal behavior. Participants, situations, and functions of communication. Speech communities, language and social stratification, bi- and multi-lingualism. (Same course as Linguistics 114.)

***116. Introduction to Ethnographic Research** (4) III.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 102. Guidelines for the proper conduct of ethnographic research; standards for evaluating ethnographic literature.

***118. Ethnosemantics** (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or the equivalent. An examination of the uses of linguistic, cognitive psychological, and mathematical analyses in the study of meaning of folk classification systems. Emphasis will be placed upon the development of skills in the collection and analysis of field data.

119A. Psychological Anthropology (4) I, Joseph
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. The individual in primitive societies. Methods and theories in the study of culture, society and the individual. Explorations of evolutionary and adaptational approaches to problems posed in the study of the individual in past and contemporary primitive societies.

119B. Psychological Anthropology (4) II, Joseph
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. The individual in complex societies. Methods and theories in the study of culture, society and the individual. Explorations of evolutionary and adaptational approaches to problems of the individual in rural and urban areas, in the labor process, under conditions of poverty and warfare, in developing countries.

120. Language and Culture (4) III, Wall
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2; course 4 or Linguistics 1. Language and thought; systems of classification; linguistic aspects of culture and society.

121. Folklore (4) III, Crowley
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) I, 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.

***123. Political Anthropology** (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. A survey of functional, structural, organizational, and decision-making approaches to primitive, tribal, and peasant political organization. Some attention will be given to political modernization within the setting of the colonial situation.

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, rituals and symbols, and religious movements. Extensive discussion of ethnographic examples and analysis of social functions of religious institutions.

***125. Comparative Educational Anthropology** (4) III.
Lecture—3 hours; discussion—1 hour. A comparative analysis of educational systems in terms of their embodiment and communication of basic cultural values. Examination of content, mode of instruction, and social relationships with educational institutions in several different cultures.

126. Anthropology of Development (4) III, 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, Joseph
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) III. Davis
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Theoretical: discussion of theories of social organization with primary emphasis on typology and classification of family and kinship systems.

***130. Sex Roles: An Anthropological Perspective** (4) II. Joseph
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Study of sex roles in primitive and complex societies. Impact of different political and economic systems on male and female activities and identities in evolutionary perspective. Issues from the contemporary women's movement around the world.

***135. Peoples and Cultures of Southeast Asia** (4) III. Davis
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or the equivalent, or consent of instructor. The development of major cultural traditions, the patterns of ecological relationships, and comparative social organization of ethnic and regional groups in Southeast Asia. Offered in even-numbered years.

139A. Peoples of Africa (4) I, Curley
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Ethnographic survey of West Africa and the Congo Basin with analyses of representative societies which illustrate problems of general theoretical concern. A major consideration will be the continuities and discontinuities between periods prior to European contact and the present.

***139B. Peoples of Africa** (4) I, Curley
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Ethnographic survey of Eastern, Central, and Southern Africa with analyses of representative societies which illustrate problems of general theoretical concern. Major consideration will be continuities and discontinuities between periods prior to European contact and the present.

140. Peoples of Afroamerica (4) II. Crowley
Lecture—3 hours; discussion—1 hour. A study of the cultural implications of slavery and the contribution of Africans to the national cultures of the Americas.

141. Cultural Ecology (4) III. Orlove
Lecture—3 hours; discussion—1 hour. A comparative survey of the interaction between diverse human cultural systems and the environment of the peoples that practice them. Primary emphasis is given to people living in rural and relatively undeveloped environments as a basis for interpreting more complex environments. (Same course as Environmental Studies 141.)

***142. Cultural and Environmental Perception** (4) I.
Lecture—3 hours; individual research project. An examination of man's relationship to the environment through the study of culture. The nature of subjective models and their impact upon environmentally oriented behavior. Focuses upon classification and decision making. (Same course as Environmental Studies 142.)

143. Contemporary Societies of South America (4) II. Orlove
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. An introductory survey of the history and contemporary structure of South American society. Social, economic and political organization in the countryside and city. Patterns of national integration and conflict.

***146. Ethnology of Europe** (4) III.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or Sociology 1 or the equivalent. Ethnographic survey of selected areas of Europe as examples that illustrate issues of general theoretical concern. Special attention will be given to problems arising from the urbanization process and to relationships between national governments and rural populations.

***147A. Peoples of the Pacific** (4) II. Boyd
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Aboriginal cultures of Micronesia, Melanesia, and Polynesia in prehistoric and modern times. Primary emphasis will be given to comparative social organization.

147B. Peoples of the Pacific (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. The effects of European colonization of the Pacific upon the cultures of Micronesia, Melanesia, and Polynesia.

***148A. Peoples of the Middle East** (4) III. Joseph
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of the Arab peoples of the Eastern Mediterranean. Topics include class relations, kinship organization, sex roles, religious behavior, ethnic identities, systems of politics. Impact of European colonization, contemporary political movements and social change.

***148B. Peoples of the Middle East** (4) II. Joseph
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of the Arab peoples of North Africa. Topics include class relations, kinship organization, sex roles, religious behavior, ethnic identities, systems of politics. Impact of European colonization, contemporary political movements and social change.

***150. Primate Evolution Laboratory** (3) III.
Lecture—1 hour; laboratory—5 hours. Prerequisite: course 155 or 151 (may be taken concurrently). Osteological, dental, and neuroanatomical studies of living and fossil primates. Limited enrollment.

151. Primate Evolution (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; Zoology 2 recommended. The 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. Nature and results of the evolutionary processes involved in the formation and differentiation of mankind.

153A. Human Variation (4) I, Smith
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1, 13, Statistics 13 or the equivalent; Biological Sciences 1 or 10 recommended. The origin, meaning and methods of analysis of differences among human populations. Racial differences, such as those in blood groups, physiology, morphology, pigmentation, and dermatoglyphics, will be considered relative to the evolutionary factors involved.

***153B. Human Biology** (4) II. Smith
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 153A, Genetics 120 or the equivalent. The processes of human micro-evolution responsible for biological differences among human populations. Special attention will be given to the geographical distributions of genetic polymorphisms among human populations with special reference to disease as a selective mechanism.

154A. Primate Behavior and Ecology (4) I, Rodman
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. The social behavior and ecology of the prosimians, monkeys, and apes, and their relevance to the evolution of human behavior and social groupings.

154B. Primate Behavior and Ecology (4) III. Rodman
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 154A, Statistics 13 or the equivalent knowledge of statistics, and consent of instructor. Continuation of course 154A for students interested in practical methods of studying, describing and analyzing the behavior and ecology of primates. Laboratories will consist of direct observation of captive primates and local birds with appropriate quantitative analysis of observations.

***155. Comparative Primate Anatomy** (4) III. McHenry
Lecture—2 hours; laboratory—4 hours. Prerequisite: Zoology 2-2L. 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** (4) III. Smith
Lecture—3 hours; discussion—1 hour. Prerequisite: course 153B. The application principles and methods and theory of human populations genetics to the study of the origin and meaning of evolutionary and geographic patterns of both discrete and continuous human racial variation.

162. Peasant Society and Culture (4) II. Orlove
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Comparative study of peasant communities, utilizing historical and ethnographic sources; analysis of urban-rural relations; problems of economic development and cultural change.

***163. Anthropology of Complex Societies** (4) II. Orlove
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Examination of local-level social organization in state-organized societies. Major topics include patron-client relations and brokers; regional systems; ethnicity; interrelation of formal institutions and informal social relations. Examples are taken from urban areas and peasant groups.

***190. Cultures of China and Korea** (4) III.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Ethnological and comparative treatments of two cultures with emphasis on the village level.

***191. Culture of Japan** (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Development of Japanese cultural traditions; social structure and social trends.

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (True 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.)

***195. Field Course in Archaeological Method** (3) III. True
Laboratory—8 hours. Prerequisite: course 3. Lectures, museum preparation, and weekend excavations. May be repeated for credit with consent of instructor. Limited enrollment.

***196. Archaeological Method** (3) III. True
Laboratory—6 hours. Prerequisite: course 195 and 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.

197T. Tutoring in Anthropology (1-5) I, II, III. The Staff (True in charge)
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 (True in charge)
Discussion—3 hours. Prerequisite: consent of instructor. Directed reading and group discussion of selected anthropological problems. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (True in charge)
(P/NP grading only.)

Graduate Courses

201. History of Anthropological Theory (4) I, Curley
Lecture—2 hours; discussion—1 hour. The historical development of the various fields of anthropology with emphasis upon their interrelationships.

***202. History and Theory of Physical Anthropology** (4) II. The Staff
Seminar—3 hours. The history of thought in physical anthropology and an analysis of the 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, Baumhoff
Seminar—3 hours. The history of thought in archaeology and analysis of research methods.

204. Contemporary Issues in Anthropological Theory (4) II.
Seminar—3 hours; one unit for paper required. Prerequisite: course 2, 102 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.

206. Research Design and Method in Social Anthropology (4) I, Joseph
Seminar—3 hours; term paper. Prerequisite: graduate standing. 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 ethical considerations.

***209. Objectives and Methods for College Teaching of Anthropology** (2) I. 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) I, ———, III, Joseph
Seminar—3 hours. Analysis of various phases of culture, such as religion, economics, law, and folklore. May be repeated for credit with consent of instructor.

***211. Advanced Topics in Cultural Ecology** (3) I, Orlove
Lecture—3 hours. Prerequisite: graduate standing; Anthropology/Environmental Studies 141 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 odd-numbered year. (Same course as Ecology 211.)

216. Problems in Archaeological Method (4) II. True
Seminar—3 hours. Techniques for analyzing archaeological data; application to various prehistoric cultures. May be repeated for credit with consent of instructor.

***217. Andean Prehistory: Theory and Method** (4) II. True
Seminar—3 hours. 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.

220. Field Course in Linguistics (4) III. Olmsted
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) II. Seminar—3 hours. 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. Joseph
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. 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) II. Curley
Seminar—3 hours. Advanced study of current problems in the anthropological study of religion.

***239. Problems in African Society and Culture** (4) I. Curley
Seminar—3 hours. Diachronic analyses of traditional institutions in sub-Saharan Africa.

***240. Problems in Afro-American Studies** (4) III. Crowley
Seminar—3 hours. Comparative studies of selected Black communities in the New World.

***242. Problems in African Prehistory** (4) I. Baumhoff
Seminar—3 hours.

***245. Ethnology of Northern and Central Asia** (4) II. Olmsted
Seminar—3 hours. 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. Olmsted
Seminar—3 hours. 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) III. McHenry
Seminar—3 hours. 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. Concepts and Problems in Physical Anthropology (4) III. Smith
Seminar—3 hours.

***254. Primate Behavior** (4) III. Rodman
Seminar—3 hours. Prerequisite: course 154B or the equivalent. Analysis of primate behavior, with particular emphasis on preparation for field studies.

***265. Concepts and Problems in Applied Anthropology** (4) II. Seminar—3 hours. 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.

***280. Ethnohistorical Theory and Method** (4) II. Forbes
Seminar—3 hours. A discussion of the ethnohistorical method; the utilization of diverse types of data, especially documentary sources to reconstruct socio-cultural history. Particular attention devoted to the applied uses of ethnohistory in the solution of contemporary social problems.

***292. Seminar in Anthropological Linguistics** (4) II. Wall
Seminar—3 hours.

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)

Marc Pilisuk, Ph.D., Chairperson of the Department
Department Office, 106 AOB-4 (752-0770)

Faculty

- J. Howard Adams, Ph.D., Associate Professor
- Edwin B. Almirol, Ph.D., Assistant Professor
- Louise M. Bachtold, Ed.D., Professor
- Keith Barton, Ph.D., Associate Professor
- Richard Berteaux, M.S., Associate Professor
- Edward J. Blakely, Ed.D., Professor
- Brenda K. Bryant, Ph.D., Associate Professor
- Glen Burch, Ed.D., Lecturer Emeritus
- Frances Butler, M.A., Professor
- L. Clair Christiansen, M.A., Lecturer
- Susan Crockenberg, Ph.D., Associate Professor
- Noreen G. Dowling, Ph.D., Lecturer
- Jack D. Forbes, Ph.D., Professor (*Applied Behavioral Sciences, Anthropology*)
- Isao Fujimoto, M.A., Lecturer
- Barbara G. Goldman, Ph.D., Lecturer and Supervisor of Teacher Education
- Dolph E. Gotelli, M.A., Associate Professor
- James Grieshop, Ph.D., Lecturer
- Lawrence V. Harper, Ph.D., Professor
- Glenn R. Hawkes, Ph.D., Professor
- Sarah H. Hutchison, M.Ed., Lecturer
- J. Leonard Joy, Ph.D., Visiting Professor
- Elwood M. Juergenson, Ph.D., Professor Emeritus
- George Kagiwada, Ph.D., Associate Professor
- Rosemarie Kraft, Ph.D., Assistant Professor
- Gyongy Laky, M.A., Acting Associate Professor
- James G. Leising, Ph.D., Lecturer and Supervisor of Teacher Education
- Peter C. Y. Leung, M.S., Lecturer
- George C. Longfish, M.F.A., Associate Professor
- David B. Lynn, Ph.D., Professor
- E. Dean MacCannell, Ph.D., Associate Professor
- Helge B. Olsen, Senior Lecturer
- Marc Pilisuk, Ph.D., Professor
- Mary C. Regan, Ph.D., Associate Professor
- David Rising, M.A., Lecturer
- Katherine W. Rossbach, M.A., Professor Emeritus
- JoAnn A. Stabb, M.A., Lecturer
- Orville E. Thompson, Ph.D., Professor
- Jane N. Welker, M.A., Lecturer
- Miriam J. Wells, Ph.D., Assistant Professor
- Emmy E. Werner, Ph.D., Professor

The Major Program

Applied Behavioral Sciences focuses on human and community development and prepares you for creative work in helping others improve their social and physical environments. The study of human social behavior is emphasized together with study of the processes and strategies of social change. Knowledge of the behavioral and environmental sciences is integrated with development of the skills necessary to using this knowledge in solving social problems. The curriculum is intended primarily if your career goals are oriented toward public, community, and institutional involvement. Examples of employment opportunities in a wide variety of settings include community development, community education, institutional development, and inter-group relations. The breadth subject matter is designed to provide foundations of knowledge in the natural and social sciences and the humanities and to develop skills of inquiry and creative endeavor. You and your adviser select course sequences in Applied Behavioral Sciences

and other areas that are most appropriate to your educational and career goals. *The Applied Behavioral Sciences Major is a student-designed program.*

Applied Behavioral Sciences

B.S. Major Requirements:

UNITS

Depth Subject Matter 60
All courses must be upper-division and two-thirds of the units must be in behavioral sciences.

Individualized program, including senior project, to be determined by student and advisory committee. A minimum of 20 units in Applied Behavioral Sciences courses is required.

Breadth Subject Matter 80
A minimum of 12 units in each of the following areas of study:

- (a) Inquiry: intellectual skills of inquiry and critical analysis.
- (b) Environmental studies: understanding the dynamics of interaction of people and their environment.
- (c) Personal and social behavior: understanding the dynamics of human relationships extending from the individual to the international level.
- (d) Creative expressions: exploration and development of the student's own creative powers, intellectual and aesthetic.
- (e) Basic communication: skill in oral and written communication.

Unrestricted Electives 40
Total Units for the Major 180

Breadth Subject Matter
A list of suggested courses in each of the study areas, (a) through (e), may be obtained from the Advising Office, 119 AOB-4.

Other Requirements
Admission: develop in consultation with an adviser, a statement of academic and career objectives and a plan for attaining stated goals.

Graduation: minimum of one year in residence in the major after completion of major proposal and satisfactory completion of supervised field experience, internship, thesis, or other creative activity.

Major Adviser. M.J. Wells.

Graduate Study. See page 99 or the *Announcement of the Graduate Division*.

Related Courses. See Environmental Studies 10, 101, 141.

Courses in Applied Behavioral Sciences

Lower Division Courses

17. Population Problems: Issues in Human Ecology (2) I, Fujimoto; II, Howard (Wildlife and Fisheries Biology)
Lecture—2 hours. An interdisciplinary orientation to the critical issues of human ecology and the numerous crises that bear upon the world community. Special emphasis is placed on the interrelationships of the natural ecosystem, population growth, and control, availability of resources, social development, and economic stability. (P/NP grading only.)

18. Scientific Myth and Social Bias (3) III. Dowling
Lecture—2 hours; discussion—1 hour. Assumptions and biases in different fields of knowledge, taboo topics, and the nature of evidence in the public and academic communities; fit between University education and issues of society.

19. The Community (3) I, MacCannell
Lecture—2 hours; discussion—1 hour. Exploration of ways in which people come together, and how this is reflected in the expression of community; examination of the dynamics of community change.

47. Orientation to Community Resources (2) II, III. The Staff (Pilisuk in charge)
Field trip—3 days; seminar—three 2-hour sessions. (Course given between quarters). Prerequisite: consent of instructor. Field trip to educational, social, and welfare

agencies in California. Observation and discussion with staff members of different agencies which serve the needs of families and children. Advance reservations required. (P/NP grading only.)

92. Internship (1-12) I, II, III. The Staff (Pilisuk in charge) Field placement—3-36 hours. Prerequisite: consent of instructor. Supervised internship, off and on campus, in community and institutional settings. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Pilisuk in charge) (P/NP grading only.)

Upper Division Courses

151. Community Research and Analysis (4) I, II. Fujimoto Lecture—4 hours. Prerequisite: consent of instructor. Theories on the emergence and structure of contemporary communities. Ethnographic, power structure and comparative approaches to community studies. Ways to incorporate research into programs for community change and development.

152. Community Development (4) II. Fujimoto Lecture—4 hours. Prerequisite: course 151 recommended. Introduction to principles and strategies of building institutions so community people can effect change. Examination of styles of citizen participation and control and the various roles of change agents in working with communities for their own self-development.

153. Community Organizations, Institutions and Resources (4) III. The Staff (Pilisuk in charge) Lecture—4 hours. Prerequisite: course 151 or 152. Analysis of resources, organizations, institutions, agencies, and groups in the community, and how each affects the development process.

***154. Theories in Community Change** (4) I, MacCannell Lecture—4 hours. Prerequisite: course 151, plus one other course in Applied Behavioral Sciences. Consideration of the concepts and theories of the social change process pertinent to community development.

155. Communication Skills for Community Development (4) III. Pilisuk Lecture—4 hours. Prerequisite: course 151 or 152. Communication skills and techniques in community development programs, to include group process and human relations methods useful in community development.

159A. Field Experience in Community Development (12) III. Fujimoto Prerequisite: course 153 or consent of instructor. Field assignment-internship with community and grassroots groups, analysis of resources and alternatives for resolution of community development needs.

159B. Field Problems (3) III. Fujimoto Seminar—3 hours. Prerequisite: course 159A and consent of instructor. Developing, implementing and evaluating field research and problems.

160A. Institutional Research Methods in Applied Behavioral Sciences (4) II. MacCannell Lecture—4 hours. Prerequisite: upper division status; courses 162 and 163 highly recommended. Application of behavioral science research methodology to multidisciplinary problems confronting organizations. Students electing this course may not receive credit for Native American Studies 140.

***160B. Research Design and Analysis of Institutions** (4) II. Regan Lecture—3 hours; discussion—1 hour. Prerequisite: course 160A and either Education 114, Statistics 13, or consent of instructor. Applied behavioral science research design and analysis for organization. Methods of data analysis, tests of significance, and use of computer in data processing.

162. People, Work and Technology (4) I, Wells Lecture—3 hours; discussion—1 hour. Use of human resources in all types of work. Emphasis is on the motivation to work, structure of organizations, and the impact of technology on human beings in work situations. The transition from college to the work force is considered.

163. Behavior of Community Organizations (4) II. Regan Lecture—4 hours. Prerequisite: course 162 or consent of instructor. How community organizations function and how members of organizations interact to each other, the organization, and those people who are clients of the organization. Effects of leadership, motivation, group dynamics, communications, and power are considered.

164. Theories in Institutional Change (4) III. Regan Lecture—2 hours; discussion—2 hours. Prerequisite: course 162. The institution as an open system which changes in response to the internal and external environ-

ment. Emphasis on structural, technological and humanistic approaches to change.

171. Housing (4) III. Wells Lecture—4 hours. Exploration of the shelter aspects of family environment. Study of technological, social, economic, and aesthetic factors affecting the nature and organization of family and community housing.

172. Social Inequality: Issues and Innovations (4) I, 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. Dowling 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. Current Issues in Post-Secondary Education (4) I. Dowling Lecture—4 hours. Prerequisite: course 151 or 152 recommended; consent of instructor. Historical background, curriculum, governance and finance for the segments of post-secondary education in California. Role of post-secondary education in the community.

175. Education in the Community (4) I, Grieshop Lecture—4 hours. Prerequisite: upper division standing. Philosophical consideration of the function of education in the community. Relationships of community and non-formal education to formal education, and schooling to individual, community and national development. Study of planning process and role of education in institutional and social settings.

***176. Comparative Ethnicity** (4) III. Wells 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.

177. Social Aspects of Aging (4) III. Burch, Hawkes Lecture-discussion—4 hours. Prerequisite: Human Development 100C or Psychology 115 recommended. Major characteristics, needs and interests of older people in contemporary America. Emphasis on social problems and community approaches to their solution.

190. Proseminar in Applied Behavioral Sciences (1) I, II, III. Regan Seminar—1 hour. Prerequisite: consent of instructor. Discussion of selected critical issues in the applied behavioral sciences. Required of seniors in the Applied Behavioral Sciences major. May be repeated for credit. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Pilisuk in charge) Field placement: 3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Supervising internship, off and on campus, in community and institutional settings. (P/NP grading only.)

196. Senior Project in Applied Behavioral Sciences (1-5) I, II, III. The Staff (Pilisuk 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 (Pilisuk 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 (Pilisuk 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 (Pilisuk in charge) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Pilisuk in charge) (P/NP grading only.)

Graduate Courses

201. Planning Processes in Applied Behavioral Sciences (4) I, Thompson 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) II. Regan

Lecture—3 hours; supervised practice in an institution studying the process of change—3 hours. Prerequisite: course 201. Study of institutional processes, resource allocations, communication networks, program priorities and destruct mechanisms needed for change.

203. Evaluation and Decision Making (4) III. Goldman Lecture—3 hours; supervised practice in evaluation and decision making—3 hours. Prerequisite: course 202. The study of decision-making behavior, theoretical formulations of evaluation and decision making, value conflicts, multiple information requirements at different organizational levels, research techniques and the role of evaluation in programs.

240. Community Development: Research and Analysis (4) I. MacCannell Seminar—4 hours. Prerequisite: course 160A or Sociology 46A or the equivalent and a course in statistics. Methods of analyzing institutional, community, and regional social structure, as preparation for planned change. Research design and the management of large-scale data files.

241. Community Development: Intervention Strategies (4) II. Rochin (Agricultural Economics) Seminar—4 hours. Prerequisite: course 240 and Agricultural Economics 100A. Economic theory and intervention strategies affecting nonmetropolitan communities. Human resources, community services and infrastructure, industrialization and technological change, policies and plans for mobilizing resources for community development.

242. Community Development: Program Management (4) III. The Staff (Pilisuk in charge) Seminar—4 hours. Prerequisite: course 241. Planning, organization, financing and administration of social change projects or programs at the community or city level.

290. Seminar (1) II, III. Thompson Seminar—1 hour. Analysis of research in applied behavioral sciences. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Pilisuk in charge)

299. Research (1-6) I, II, III. The Staff (Pilisuk in charge) (S/U grading only.)

Aquaculture

See Animal Science

Art

(College of Letters and Science)

Richard D. Cramer, M.F.A., Chairperson of the Department

Department Office, 125 Art Building (752-0105)

Faculty

L. Price Amerson, Jr., Ph.D., Lecturer
Robert C. Ameson, M.F.A., Professor
Joseph A. Baird, Ph.D., Senior Lecturer
Richard D. Cramer, M.F.A., Professor
Daniel J. Crowley, Ph.D., Professor (*Art, Anthropology*)

Roy R. DeForest, M.A., Professor
Mary H. Fong, Ph.D., Assistant Professor
Robert J. Grigg, Ph.D., Assistant Professor
William Henderson, M.F.A., Associate Professor
Harvey Himefarb, M.A., Associate Professor
Seymour Howard, Ph.D., Professor
Ralph M. Johnson, M.S., Professor
Manuel J. Neri, Professor
Roland C. Petersen, M.A., Professor
Jeffrey Ruda, Ph.D., Assistant Professor
Cornelia Schulz, M.F.A., Associate Professor
Daniel Shapiro, Professor
Wayne Thiebaud, M.A., Professor
Garner H. Tullis, M.A., Assistant Professor

The Major Programs

The Department of Art offers undergraduate majors in Art Studio and in the History of Art, each leading to the Bachelor of Arts degree. Both programs provide general education and preparation for further training. Some degree candidates work toward a teaching credential — some enter graduate programs here or elsewhere.

In general, members of the Studio faculty are active in research as painters, sculptors, ceramists, print-makers, photographers, and filmmakers; members of the History faculty are actively engaged in historical scholarship. Each of these activities is precisely associated with subject matters taught in the classroom, both undergraduate and graduate. Limited undergraduate offerings in museum methods and connoisseurship are given; more extensive graduate work in these fields is anticipated.

Portfolios. Entering freshmen who have studied art in high school should apply for advanced standing by submitting examples of their work for faculty review. Lower division students at Davis and transfer students will be required to keep a continuing portfolio of their work which is subject to faculty perusal at such times as when the student is declaring the major, enrolling in overflow courses, requesting independent study courses, etc.

Transfer Students. Before enrolling in Art courses at Davis, ask your faculty adviser to evaluate transfer courses in art.

Art History

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24
Art 1A, 1B, 1C, 1D	16
One course in drawing, graphics or painting	4
One course in sculpture or ceramics	4
Depth Subject Matter	36
Four courses from Group C, History of Art: select 2 courses each from two separate periods (e.g., 154A, 154B and 178B, 178C)	16
Five additional courses from Groups C, History of Art, or D, Special Study Courses	20
Total Units for the Major	60

Recommended

See recommended courses following the Art Studio major requirements below.

Art Studio

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	20
Three courses from Art 2, 3, 4, 5, 16; see prerequisites required for upper division courses	12
Two courses from Art 1A, 1B, 1C, 1D	8
Depth Subject Matter	36
Six courses, under three different artists, from Group A, Practice of Art, or D, Special Study Courses	24
One course from Group B, Theory and Criticism	4
Two courses from Group C, History of Art	8
Total Units for the Major	56

Recommended

- Both Art History and Art Studio Majors
- (a) Students interested in drawing and painting should take Art 2, 3, 4 (course 5 is recommended);
 - (b) students interested in sculpture should take Art 2, 3, 5 (course 4 is recommended); and
 - (c) students preparing for graduate work in any of the environmental design professions should take Art 2, 5, 16, 121A, 121B, 121C, 149, 168, 184.

Major Advisers. See the *Class Schedule and Room Directory*.

Minor Program Requirements:

Art History	UNITS
Upper division courses from Group C, History of Art (one lower division substitute course permissible)	18
One course must be chosen from each of four of the five follow- ing subject areas: (a) ancient; (b) medieval; (c) renaissance and baroque; (d) modern; (e) oriental art.	

Art Studio	UNITS
Upper division units chosen in con- sultation with a faculty adviser (one lower division substitute course permissible)	20
Prerequisite courses must be taken prior to enrollment in upper division courses. In- dependent study courses are not applicable.	

Teaching Credential Subject Representative. Department Chairperson. See page 105 for 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 and the M.A. degree in the history of art. Detailed information regarding graduate study may be obtained from the *Announcement of the Graduate Division*.

Courses in Art

Lower Division Courses

1A. Ancient Art (4) I, Howard
Lecture—3 hours; discussion—1 hour. Art of the pagan Mediterranean world from the prehistoric caves to the fall of the Roman Empire.

1B. Medieval and Renaissance Art (4) II, Grigg
Lecture—3 hours; discussion—1 hour. Christian, Barbarian, Moslem, and Classical traditions in European Art from the fourth through the sixteenth centuries.

1C. Baroque and Modern Art (4) III,
Lecture—3 hours; discussion—1 hour. Major styles and masters of the Western world after the Counter Reformation.

***1D. Asian Art** (4) II, Fong
Lecture—3 hours; discussion—1 hour. An 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.

2. Drawing I (4) I, II, III, The Staff
Laboratory—8 hours; to be arranged—4 hours. Form and composition in black and white.

3. Drawing II (4) II, III, The Staff
Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 2. Form and composition in color.

4. Life Drawing (4) I, II, III, The Staff
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, The Staff
Laboratory—8 hours; to be arranged—4 hours. Form in space using plaster and other media.

10. Introduction to Art: History and Appreciation (4) I, II, III, Thiebaut, Tullis
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.)

***11. Introduction to Art: Practice** (4) I, II, III, The Staff
Lecture—2 hours; laboratory—4 hours. Projects. Individual explorations in various media. Intended for students not specializing in Art. Not open for credit to students who have had Art 2, 5, or 16.

16. Descriptive Drawing (4) I, II, III, The Staff
Laboratory—8 hours; to be arranged—4 hours. Objective drawing and rendering; representations of space.

20. Myths and Symbols in Chinese Art (4) III, Fong
Lecture—3 hours; discussion—1 hour. Heritage of China as seen in the artistic expressions of its mythologies and sym-

bois perpetuated in folk cults, ancestral worship, Confucian lore, Taoist legends, and Buddhist beliefs. Intended for non-majors.

98. Directed Group Study (1-5) I, II, III, The Staff (Cramer 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 (Cramer in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

(Note—Upper division courses are listed under four groups: (A) Practice of Art; (B) Theory and Criticism; (C) History of Art; (D) Special Study Courses.)

Group A: Practice of Art

101. Painting: Materials and Carriers (4) I, III, The Staff
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, The Staff (Chairperson in charge)
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 twice for credit.

103. Advanced Drawing (4) I, II, III, The Staff (Chairperson in charge)
Laboratory—8 hours; 4 hours to be arranged. Prerequisite: course 2, 3, 4, 16, or consent of instructor. Advanced drawing, composition and form in black and white and color.

104. Figure Painting (4) I, II, III, The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 101 or consent of instructor. Advanced figure drawing; painting using the human figure as subject. May be repeated once for credit.

110. Photography I (4) I, II, III, Himelfarb, Petersen
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, or consent of instructor. Photography as an art form. Experiments with the camera and light sensitive materials.

111. Photography II (4) III, Himelfarb
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 110 or consent of instructor. The art of camera and light sensitive materials: tonal control, multiple exposure, synthetic negatives, etc. May be repeated twice for credit.

112. Ceramics I (4) I, II, Ameson
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Ceramic forms and processes.

113. Ceramics II (4) I, III, Ameson
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 112 or consent of instructor. Ceramic color and glaze, kiln firing. May be repeated twice for credit.

115. Film-making I (4) I, II, III, Henderson
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.

116. Film-making II (4) III, Henderson
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 115 or consent of instructor. The art of film-making shooting, editing and sound. Emphasis on the 16 mm. camera. May be repeated twice for credit.

121A. Architectural Design (4) I, Cramer
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 5, 16, or compensating backgrounds in design or engineering. Small buildings as an art form, visualized in cardboard, balsa, or plaster models.

***121B. Architectural Design** (4) II, Cramer
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 121A or consent of instructor. Small buildings as expressions of climate, site, structure, function, and culture, visualized in architectural drawings.

***121C. Architectural Design** (4) III, Cramer
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 121B or consent of instructor. Buildings as integrations of the influences of natural, social and aesthetic phenomena; drawings and models. May be repeated once for credit.

125. Printmaking: Relief (4) III,
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. May be repeated twice for credit.

126. Printmaking: Intaglio (4) I, III,
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 twice for credit.

127. Printmaking: Lithography (4) II. 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 twice for credit.

128. Printmaking: Serigraphy (4) III. Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Silkscreen and related stencil methods. May be repeated once for credit.

129. Printmaking: Photo-Graphics (4) I. Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Traditional print-making methods using photographically derived images: photolithography, photo-silkscreen, photo-etching, etc. May be repeated once for credit.

141. Sculpture: Non-Metal Materials (4) I, III. Johnson, Tullis Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Sculpture in compliant materials, e.g., wood, plaster, plastics, etc. May be repeated twice for credit.

***142. Sculpture: Metallic Materials** (4) III. Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Pieces made from welding processes. May be repeated once for credit.

***143. Sculpture: Metallic Materials** (4) II. Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Pieces made from casting processes. May be repeated once for credit.

144. Figure Sculpture (4) I, Neri 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.

146. Ceramic Sculpture (4) II. Arneson Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 113 or one from courses 141, 142, 143, or 144. Clay sculpture in relief and round. May be repeated twice for credit.

Group B: Theory and Criticism

147. Theory and Criticism of Photography (4) II. Himelfarb Lecture—3 hours; term paper. Prerequisite: course 2 or 5 and one art lecture course. The 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) III. Thiebaud Lecture—3 hours; term paper required. Prerequisite: course 2 or 5, and one art lecture course. Study of forms and symbols in historic and contemporary masterpieces.

***149. Theory and Criticism: Architecture** (4) II. Cramer Lecture—3 hours; seminar paper. Prerequisite: course 2 or 5; one art lecture course. Aesthetic theories of design styles, historic and contemporary.

Group C: History of Art

150. Arts of Sub-Saharan Africa (4) III. Crowley 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) I, Crowley 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. Archaic Greek Art (4) I, Howard Lecture—3 hours; term paper or gallery studies and review. The art of Greece from the Proto-geometric through Archaic periods.

154B. Classical Greek Art (4) II. Howard Lecture—3 hours; term paper or gallery studies and review. Greek art of the Gold and Silver Ages.

154C. Hellenistic Art (4) III. Howard Lecture—3 hours; term paper or gallery studies and review. Greek Art from Alexander to Julius Caesar.

***155. Roman Art** (4) III. Grigg Lecture—3 hours; term paper or gallery studies and review. The art of Republican and Imperial Rome.

162. History of Printmaking (4) II. Amerson Lecture—3 hours; term paper or gallery studies and review. The development of graphic media in the Western World from the fifteenth century to the present.

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.

***164. The Arts of Japan** (4) II. Fong 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. The Design and Development of Great Cities (4) I, Baird Lecture — 3 hours; special term project. Golden Ages of major cities in the Western world — Athens, Rome, Florence, Venice, Paris, London, New York, San Francisco. Physical patterns of urban planning and their architectural and cultural correlates.

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.

***178C. Art of the Middle Ages: Gothic** (4) III. 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) I, 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) II. 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. Late medieval painting and sculpture. Origins of the Renaissance.

***178B. Italian Renaissance Painting** (4) I, Ruda Lecture—3 hours; term paper or gallery studies and review. Painting in Italy in the fifteenth century.

178C. Italian Renaissance Painting (4) II. Ruda Lecture—3 hours; term paper or gallery studies and review. Painting in Italy in the sixteenth century.

***178D. Italian Renaissance Architecture** (4) I, Ruda Lecture—3 hours; term paper or gallery studies and review. Architecture in Italy from the thirteenth through the sixteenth centuries.

178E. Italian Renaissance Sculpture (4) II, Ruda Lecture—3 hours; term paper or gallery studies and review. Sculpture in Italy with emphasis on the fifteenth and sixteenth centuries.

179A. Baroque Art (4) III. Baird Lecture—3 hours; term paper or gallery studies and review. Western European architecture, sculpture and the art of the garden from the late sixteenth through the early eighteenth centuries.

***179B. Baroque Art** (4) II. Lecture—3 hours. Painting in Western Europe in the seventeenth century: especially the Dutch, Flemish, French, and Italian painters.

183A. Art in the Age of Revolution (4) I. Lecture—3 hours; term paper or gallery studies and review. Development of themes in European painting from 1750 to 1850 and their political implications. Artists to be studied include Goya, David, Delacroix, Constable, Turner, and Courbet.

183B. Painting from Manet to 1900 (4) II. Lecture—3 hours; term paper or gallery studies and review. Later nineteenth century developments. Emphasis on France (Impressionism, Post Impressionism, etc.).

183C. Painting in Europe, 1900-1945 (4) III. Lecture—3 hours; term paper or gallery studies and review. An examination of modern movements in painting from the beginning of the century until the end of World War II (Cubism, Futurism, Bauhaus, Surrealism, etc.). Artists include Picasso, Matisse, Kandinsky, Mondrian, Ernst.

183D. Modern Sculpture (4) II. Howard Lecture—3 hours; term paper or gallery studies and review. Sculpture Neo-Classicism to the present.

183E. Art since 1945 (4) III. Lecture—3 hours; class report and term paper. Prerequisite: course 183C recommended. Painting and sculpture in Europe and America from World War II to the present.

184. Architecture in the Twentieth Century (4) II. Cramer Lecture—3 hours; term paper and field trip. Substyles of modern architecture, with emphasis on the development of organicism by Frank Lloyd Wright and of the international style by Le Corbusier and Mies van der Rohe, etc. Subsequent developments since 1960.

***188A. Art of Latin America** (4) I, Baird Lecture—3 hours; term paper or gallery studies and review. Architecture, sculpture and painting in Mexico from 1530 to the present. The American Southwest, the colonial art of Peru, and eighteenth century to modern architecture in Brazil. European backgrounds and creative originality in the New World.

188B. Architecture of the United States (4) III. Baird Lecture—3 hours; term paper or gallery studies and review. American building, with emphasis on early colonial, Georgian, nineteenth and twentieth century developments. Particular attention to Northern California in the latter part of the course.

***188C. Painting of the United States** (4) I. 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. Proseminar in the History of Art** (4) I, III. The Staff (Chairperson 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.

Group D: Special Study Courses

192. Internship in Museums (2-12) I, II, III. The Staff (Chairperson in charge) Term paper; catalog. Supervised program of student internship in a public museum or private organization with major art collections. To be taken as part of the museum methods program, usually following course 401 or 402. May be repeated once for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Cramer in charge) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Cramer in charge) (P/NP grading only.)

Graduate Courses

201. Experiments in Art and Visual Communication (4) I. The Staff Lecture—3 hours. Original work produced for class discussion and criticism. May be repeated for credit.

***248. Problems in Representation and Iconology** (4) II. Howard Seminar—3 hours; term paper. Research into the symbolic meanings of historic motifs in art, and their visual representations.

250. Principles of Art Historical Research (4) I. Baird Seminar—3 hours. Major historic bibliographical sources and reference materials. Use of national and international facilities for research, including intercampus potential of U.C. and other libraries of California. Techniques of research in specialized fields. Methods of illustration for published papers and books; forms of printing. Required of M.A. candidates in History of Art.

***251. Seminar in Primitive Art** (4) I, Crowley Seminar—3 hours. Selected areas of special study in the arts of Africa, Oceania, and Prehistoric Europe; in certain years, study of the Indians of the Americas, pre-Conquest to contemporary.

NOTE: For key to footnote symbols, see page 130

***254. Seminar in Ancient Art: Greece** (4) II. Howard
Seminar—3 hours. Selected areas of special study in Greek art from Hellenic to later Hellenistic.

***255. Seminar in Ancient Art: Rome** (4) II. Howard
Seminar—3 hours. Selected areas of special study in Roman art from Republican to late Imperial.

263. Seminar in Chinese Art (4) I, I, Fong
Seminar—3 hours; paper. Selected areas of special study in Chinese Art.

276. Seminar in Medieval Art (4) II. Grigg
Seminar—3 hours. Selected areas of special study in medieval art from Early Christian to late Gothic.

***277. Seminar in Northern Renaissance Art** (4) III. Grigg
Seminar—3 hours. Selected areas of special study in Netherlandish and German art of the fifteenth and sixteenth centuries.

278. Seminar in Italian Renaissance Art (4) III.
Seminar—3 hours. Selected areas of special study in Italian art from trecento to cinquecento.

***279. Seminar in Baroque Art** (4) III. Baird
Seminar—3 hours. Selected areas of special study in Baroque art from late sixteenth to late eighteenth centuries.

283. Seminar in Modern European Art (4) III.
Seminar—3 hours. Selected areas of special study in art since 1800 in Europe.

***288. Seminar in American Art** (4) III. Baird
Seminar—3 hours. Selected areas of special study in art in the United States from colonial times to the present.

290. Seminar (4) I, II, III. The Staff (Graduate Adviser in charge)
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) I, II, III. The Staff (Graduate Adviser in charge)
Seminar—1 hour. May be repeated for credit. (S/U grading only.)

292. Seminar: Comprehensive Qualifying (1) I, II, III. The Staff (Graduate Adviser in charge)
Seminar—1 hour. A 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) I, II, 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. 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) III. Amerson
Seminar—3 hours. 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. Seminar and exhibition.

***403. Museum Training: Historic Materials and Techniques** (4) II. The Staff
Seminar—3 hours. Examination of works of art with emphasis on materials and methods of construction: wall paintings, panel paintings, paintings on cloth, drawings, ceramics, metals, etc. Experimentation in constructing works of art from historical writings. Collateral reading. Visits to museums.

***404. Museum Training: Problems of Conservation** (4) III. The Staff
Seminar—3 hours. Examination of works of art with emphasis on physical condition. Typical problems in preservation and restoration. Ethics and aesthetics of museum conservation. Demonstrations of scientific methods. Collateral reading. Visits to museums. Seminar and assigned papers.

Note: Various of the above courses are not offered each year; please check quarterly schedules.

Asian American Studies

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Applied Behavioral Sciences.

The Major Program

Concentration in Asian American Studies is available through the Applied Behavioral Sciences major (page 146).

Related Courses

For other Asian languages, see Oriental Languages and Civilizations.

Courses in Asian American Studies

Lower Division Courses

1. Introduction to Asian American Studies (4) I, Almirol; II, Kagiwada
Lecture-discussion—4 hours. Asian American experience, 1850 to the present with focus on Chinese, Japanese and Pilipino.

2. Contemporary Asian Experience in America (4) I, Kagiwada
Lecture-discussion—4 hours. Analysis of ethnicity, race, and culture as it relates to the identity and growth of the Asian American.

***20. Asian Calligraphy** (3) II. Leung
Lecture—2 hours; laboratory—3 hours. Prerequisite: knowledge of Cantonese, Mandarin or Japanese helpful. Introduction to Asian calligraphy stressing the technique of writing.

92. Internship (1-12) I, II, III. The Staff (Pilisuk in charge)
Field placement—3-36 hours. Prerequisite: consent of instructor. Supervised internship off and on campus in Asian community and institutional settings related to Asian American concerns. (P/NP grading only.)

Upper Division Courses

100. Asian American Communities (4) II. Kagiwada
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2 or consent of instructor. Political and social status, occupation, income, education, health, housing, and civic culture of various Asian American communities in the United States; segregation in interrelations between geographical groups, relations between rich and poor, patronism, exploitation; mobility within each ethnic group.

110. Institutional Racism and the Asian American (4) I, Kagiwada
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2 or consent of instructor. Historical and contemporary effects of institutional patterns on Asian Americans.

111. Alienation and the Asian American (4) III. Kagiwada
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2 or consent of instructor. An examination of self-awareness, alienation, and life perspective of Asians in America. Emphasis will be placed on the problems of identity formation of Asian Americans.

112. Asian American Women (4) II. The Staff
Lecture—4 hours. Prerequisite: course 1 or 2. History and struggle of Asian women in America; critically analyze their media images and stereotypes; and discuss in-depth the role of Asian Women in the community movement for social change.

***140. Speech Patterns of Asian Americans** (4) III. Leung
Lecture—4 hours. A general introduction to bilingualism as a social issue; survey of bilingual communities, problems of bilingual speakers, linguistic effects of bilingualism, particularly the effects of Asian languages in the speech patterns of Asian Americans. Offered in even-numbered years.

150A. Pilipino Experience (4) II. Almirol
Lecture—3 hours; discussion—1 hour. Culture and history of the Philippines from pre-Hispanic to the present.

150B. Pilipino Experience (4) I. Almirol
Lecture—3 hours; discussion—1 hour. Pilipinos in America with emphasis on the changing structure of the community.

192. Internship (1-12) I, II, III. The Staff (Pilisuk in charge)
Field placement—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Supervised internship off and on campus in Asian community and institutional settings related to Asian American concerns. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Kagiwada in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Kagiwada in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Courses in Cantonese

Lower Division Courses

1-2-3. Elementary Cantonese (5-5-5) I-II-III. Leung
Lecture—3 hours; recitation—2 hours. Study of Cantonese, stressing accurate pronunciation, verbal fluency, grammar and composition.

4-5-6. Intermediate Cantonese (3-3-3) I-II-III. Leung
Lecture—3 hours; recitation—1 hour. Prerequisite: course 3 or the equivalent. Continuation of course 1-2-3.

Asian Studies

See Asian American Studies (above); 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 physics of meteorological processes, including general circulation of the atmosphere and weather systems; mass and energy transfers at the planetary surface and within the atmosphere; solar and terrestrial radiation; turbulence and diffusion; atmospheric interaction with the biosphere; cloud physics and weather modification; air pollution meteorology; and developments in modern meteorological instrumentation. This field is based on applied mathematical physics, and is strongly relevant to environmental biology and human ecology. Numerous career opportunities exist in the federal and state governments, research and develop-

ment in the private sector, and education. Examples of career areas are agricultural meteorology, air-pollution forecasting and control, weather modification, hurricane, and severe weather forecasting and research, weather satellite meteorology, and numerical weather forecasting. The course of study provides a mathematical and physical science background on which a career can be built in research, education, resource management, or various areas of direct problem solving. In addition to a broad background in meteorology, the major includes a minor area to be chosen from either mathematics, computer science, environmental studies, resource management or a physical or biological science.

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

Preparatory Subject Matter	68
Mathematics (Mathematics 21A, 21B, 21C, 22B, 22C and 22A or 32)	21
Computer science (Engineering 5 or Mathematics 29)	3
Physics (Physics 8A-8B-8C)	12
Chemistry	10
Biological science (Biological Sciences 1, Botany 2 or Zoology 2-2L)	10
English and/or rhetoric (see College requirement)	8
Meteorology (Atmospheric Science 20-20L)	4
Depth Subject Matter	30
Atmospheric Science 110A, 110B, 120, 121A, and 121B	17
Upper division Atmospheric Science courses selected with adviser's approval	13
Breadth Subject Matter	28
Social sciences and humanities electives†	28
Restricted Electives	21
Resource and environmental sciences electives	6
Coordinated group of courses (minor area) to be chosen with Adviser's approval from mathematics, computer science, environmental studies, resource management, or a physical or biological science	15
Unrestricted Electives	33
Total Units for the Major	180

Major Adviser. J.J. Carroll (*Land, Air and Water Resources*).

Information Center for the major, 122 Hoagland Hall.

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. Detailed information can be obtained from the graduate adviser and the *Announcement of the Graduate Division*.

Graduate Adviser. K.K. Wagner (*Land, Air and Water Resources*).

Related Courses. See Engineering: Civil 149, 242; Environmental Studies 150A; Environmental Toxicology 131; Geography 3; Physics 105C; Water Science 202.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Courses in Atmospheric Science

Questions pertaining to the following courses should be directed to the instructor or to the Resource Sciences Teaching Center, 122 Hoagland Hall (752-1669).

Lower Division Courses

20. Introduction to Meteorology (3) I, Shaw
Lecture—3 hours. Prerequisite: an introductory course in calculus. Basic concepts of modern meteorology: weather and weather elements, atmospheric circulations, clouds, precipitation, radiation, instruments and observations, meteorological satellites.

20L. Introduction to Meteorology Laboratory (1) I, Shaw
Laboratory—3 hours. Prerequisite: course 20 (preferably taken concurrently). Introduction to meteorological instruments and observations; weather station visits; weather maps and charts; special films on weather modification, air pollution, and atmospheric circulation; physical experiments illustrating atmospheric phenomena.

92. Atmospheric Science Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn 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; restricted to lower division students. Group study of selected topics. (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

105. Microclimate of Agricultural Systems (3) I, Hatfield
Lecture—3 hours. Prerequisite: upper division standing in biological or physical sciences. Energy balance, air and soil temperature, wind, water vapor, carbon dioxide patterns within the microclimate structure. Microclimate modification by windbreaks, frost protection and other methods of energy balance manipulation.

110A. Weather Analysis and Forecasting (4) III. Wagner
Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 20, 20L, 120, 121A, 121B (concurrently); knowledge of Fortran (Engineering 5). Examination of thermodynamic variables and processes, kinematics, and dynamics as an integral part of the dynamic theory of weather systems. Graphical and numerical techniques, including vertical cross sections, thermodynamic diagrams and pressure surface analysis, for study of weather systems.

110B. Weather Analysis and Forecasting (4) I, Carroll
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 110A. Application of dynamic theory to weather systems. Operational forecasting techniques including interpretation of the numerical forecasts, local detailed forecasts, tropical meteorology, satellite meteorology and numerical analysis of meteorological data.

120. Atmospheric Thermodynamics and Statics (3) I, Weare
Lecture—3 hours. Prerequisite: Mathematics 22C, Physics 8C, course 20 (may be taken concurrently). The atmosphere at rest: atmospheric composition and structure, thermodynamics of atmospheric gases, thermal properties of dry and moist air, hydrostatic equilibrium and stability criteria, and thermodynamic diagrams in meteorology.

121A. Atmospheric Dynamics (3) II. Myrup
Lecture—3 hours. Prerequisite: course 120. 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. Myrup
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.

123. Micrometeorology (4) III. Shaw
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16B. Physical processes in the atmosphere near the ground; laminar and turbulent flow; transfer of heat, mass, and momentum across the surface-atmosphere interface. Diffusion and turbulent transfer creating wind, temperature and mass profiles near the surface.

124. Meteorological Instruments and Observations (3) II. The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 20 or the equivalent. Modern meteorological instruments and their use in meteorological observations and measurements. Both standard and micrometeorological instruments are included.

125. Atmospheric Physics (3) II. Stage
Lecture—3 hours. Prerequisite: course 120. Study of physical processes in the atmosphere. Emphasis will be given to microphysics of cloud growth and atmospheric radiation and global energy balance.

***128. Radiation Instrumentation and Measurements** (3) III. Lecture—2 hours; laboratory—3 hours. Prerequisite: course 125 or consent of instructor. Methods of measuring solar and terrestrial radiation, types and characteristics of specific instruments, errors of measurement, temporal and spectral response of instruments, results of measurements.

131. Air Pollution Meteorology (3) III. Flocchini
Lecture—3 hours. Prerequisite: Physics 2C, Mathematics 16B, Chemistry 1B, or consent of instructor. Comprehensive overview of the relationship of meteorology to air pollution. Topics include: types and sources of pollutants; photochemistry, diffusion and transport, monitoring and air quality standards; inadvertent weather modification; and air pollution climatology.

133. Biometeorology (4) I, Hatfield
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 and an additional course in a biological discipline; Mathematics 16B; course 123 recommended. An introduction to biometeorology and survey of atmospheric and biological interactions. Physical basis for plant, animal and human response and adaptation to short-term and long-term meteorological events.

150. Numerical Weather Prediction (4) I, Wagner
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 120, 121A, 121B; computer programming capability; or consent of instructor. Numerical weather prediction with the quasi-geostrophic system. Technical aspects of objective analysis, map projections and computational stability of prediction equations.

192. Atmospheric Science Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience 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

210. Atmospheric Physics (3) II, Weare
Lecture—3 hours. Prerequisite: course 125 and 121A (may be taken concurrently). Selective introduction to the physical processes within the atmosphere. Emphasis will be given to radiative transfer and remote sensing, global atmospheric chemistry, and the physical and dynamic processes in the upper atmosphere.

***221. Advanced Atmospheric Dynamics** (3) III
Lecture—3 hours. Prerequisite: courses 120, 121A, 121B, or the equivalent. The energetics of atmospheric flows will be examined. Particular emphasis placed on the interactions of various space and time scale phenomena on energy transfers and transformations. Offered in even-numbered years.

***222. Radiation in Planetary Atmospheres** (3) II. Lecture—3 hours. Prerequisite: course 125 or the equivalent. Theory and observations of radiation in planetary atmospheres. Absorption, transmission, scattering by atmospheric gases, aerosols, and clouds, gaseous emission; effects of surface reflection; radiative energy budget of the atmosphere and of the planet as a whole; methods of measurement. Offered in even-numbered years.

223. Advanced Micrometeorology (3) I, Stage
Lecture—3 hours. Prerequisite: course 123 and 121B or the equivalent. Turbulent transfer of momentum, heat and moisture in the atmospheric boundary layer. Stability parameters. Air/sea interaction. Numerical boundary layer models. Micrometeorology of plant canopies and cities. Microclimate modification. Turbulent diffusion in the atmospheric boundary layer.

NOTE: For key to footnote symbols, see page 130

230. Atmospheric Turbulence (3) II. Shaw
Lecture—3 hours. Prerequisite: course 223 or the equivalent. Dynamics and energetics of turbulent motion; transition to turbulence, energy dissipation, kinetic energy and thermal variance equations, convective and mechanical turbulence, integral methods. Statistical methods; probability density function, moments, spectral analysis. The Kolmogoroff theory; spectrum, structure function and diffusion predictions.

231. Advanced Air Pollution Meteorology (3) II. Carroll
Lecture—2 hours; discussion—1 hour. Prerequisite: course 123, 131 and Civil Engineering 149. Course emphasizes interrelation between atmospheric processes and air pollutants, primarily: transport and diffusion of primary and secondary pollutants; their effects on local radiation budget, cloud and precipitation formation and secondary pollutant formation.

233. Topics in Advanced Biometeorology (3) III. Hatfield
Lecture—2 hours; discussion—1 hour. Prerequisite: course 133 or consent of instructor. Study of current topics in biometeorology focusing on interactions of plants with the weather. Biological energy budgets and adaptations to changes in energy regime. Quantification of weather parameters for optimum biological response. Offered in odd-numbered years.

240. General Circulation of the Atmosphere (3) III. Carroll
Lecture—3 hours. Prerequisite: courses 120, 121A, 121B. Description of global angular momentum, mass and energy balances. An investigation of physical processes on which they depend and relationships of these balances to weather and climate.

241. Climate Dynamics (3) III. Weare
Lecture—3 hours. Prerequisite: courses 120, 121A, 121B or the equivalent, Engineering—Applied Science 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 even-numbered years.

250. Meso-Scale Meteorology (3) II. Wagner
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 even-numbered years.

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.)

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.)

Avian Medicine

See Epidemiology and Preventive Medicine

Avian Sciences

(College of Agricultural and Environmental Sciences)

F. Howard Kratzer, Ph.D., Chairperson of the Department

Department Office, 109 Asmundson Hall (752-1300)

Faculty

Ursula K. Abbott, Ph.D., Professor
Hans (Johannas) Abplanalp, Ph.D., Professor
Ray E. Burger, Ph.D., Professor
Ralph A. Ernst, Ph.D., Lecturer
C. Richard Grau, Ph.D., Professor
F. Howard Kratzer, Ph.D., Professor
Dorothy C. Lowry, M.A., Lecturer
Frank X. Ogasawara, Ph.D., Professor
Leo C. Norris, Ph.D., Lecturer
Pran N. Vohra, Ph.D., Professor
2, 3 Wesley W. Weathers, Ph.D., Associate Professor
Barry W. Wilson, Ph.D., Professor
Wilbor O. Wilson, Ph.D., Professor Emeritus
Allen E. Woodard, M.S., Lecturer

The Major Program

Avian Sciences is the study of birds and the ways in which they relate to and are useful to man. The major provides a balanced program if your interest is in birds — including the study of avian wildlife and their environments, production and marketing of domestic birds and eggs, and basic and applied laboratory research on birds—and a broad knowledge of biological science. You may seek a career in health-oriented research, the teaching of biology, gamebird production, domestic and foreign agricultural extension and advisory services, governmental agencies or a diversified and progressive poultry industry. The flexibility of the program and the close personal interaction between students, faculty, and specialists in the field permit you to play a large role in selecting and designing your own course work. You may specialize in a bachelor's program that qualifies you for a particular job; or you may choose a program to meet other broader intellectual and cultural interests. Independent study, undergraduate research, and work-learning experiences are features emphasized in the program.

Avian Sciences

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
Preparatory Subject Matter	41
Avian Sciences	3
Biological sciences (Biological Sciences 1, Bacteriology 2, Animal Science 1, 2 and/or Plant Science 1 or 2)	15
Chemistry (Chemistry 1A, 1B, 8A and/or 8B)	13
Statistics (Statistics 13)	4
Physics (Physics 1A and 1B)	6
Depth Subject Matter	51
Biochemistry (Biochemistry 101A, 101B)	6
Genetics (Genetics 100A, 100B)	6
Nutrition (Nutrition 110)	5
Physiology (Physiology 110)	5
Laboratory units in above listed subjects	4
Specialized courses related to avian species	25
Breadth Subject Matter	24
English and/or rhetoric: choose from English 1, 2, 3, 5F, 5P, and/or Rhetoric 1, 3	8
Social sciences and humanities electives†	16

Restricted Electives to supplement or expand any of the above areas

Unrestricted Electives

Total Units for the Major 180

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Major Adviser. F. X. Ogasawara.

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. Detailed information on graduate study is available through the graduate adviser, or obtain the *Announcement of the Graduate Division*. See also page 99.

Graduate Adviser. A. E. Woodward.

Related Courses. See Agricultural Economics 130; Food Science and Technology 120, 121; International Agricultural Development 102; Nutrition 123; Physiology 103, 117, 117L; Zoology 100, 100L.

Courses in Avian Sciences

Lower Division Courses

11. Applied Avian Biology (3) I. Ogasawara
Lecture—3 hours. A survey of principles and practices involved in poultry production. Designed for students not specializing in avian sciences.

11L. Laboratory in Applied Avian Biology (2) I. Ogasawara
Lecture—1 hour, laboratory—3 hours. Prerequisite: course 11 (may be taken concurrently) or consent of instructor. Laboratory studies in poultry biology; techniques and economics of poultry production.

***12. Survey of Poultry and Allied Industries** (3) III. Ogasawara, Ernst.
Lecture—2 hours; conference—1 hour. A survey of industries concerned with poultry products in the U.S.A. and various regions of the world; hatchery, industry, feed industry, egg and meat production, poultry products, specialized enterprises. Offered in even-numbered years.

13. Birds, Man, and the Environment (3) III. Grau, B. W. Wilson.
Lecture—2 hours, discussion—1 hour, project requiring minimum 20 hours; field trip. Prerequisite: course in biology recommended. Birds in the world of man; folklore, art, literature, uniqueness, domestication, recreation, game birds, zoos, falconry, endangered species, public health, in research, as food sources.

13L. Birds, Man, and the Environment: Laboratory (1) III. Grau
Laboratory—3 hours. Demonstrations and field trips for students enrolled concurrently in course 13.

***15. Biology of Birds of Prey** (3) II. Weathers
Lecture—3 hours; 4 weekend field trips optional. Prerequisite: some familiarity with raptorial species and course 13 recommended. Introduction to birds of prey with emphasis on anatomy, physiology, behavior, handling, and husbandry.

92. Internship in the Avian Sciences (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: sophomore standing preferred; consent of instructor. Work-learning study 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 and their products. (P/NP grading only.)

Upper Division Courses

***100. The Biology of Birds** (3) I, Weathers
Lecture—2 hours; discussion—1 hour. Prerequisite: background in general biology recommended. Aspects of biology (anatomy, physiology, behavior, nutrition, reproduction, and adaptation) that govern the life of birds. Emphasis on those features of birds, domestic, wild and experimental, which are distinctive and unique for animals with feathers.

***100L. Biology of Birds Laboratory** (1) I, Weathers
Laboratory—3 hours. Prerequisite: course 100 (concurrently). Laboratory exercises in production, incubation, nutrition, and physiology of domestic and wild birds.

102. Fertility and Hatchability in Birds. (3) III. Abbott
Lecture—2 hours; two field trips. Prerequisite: Biological Sciences 1 and Chemistry 8A. Reproduction in domestic and wild bird species. Influences of genetic, environmental and behavioral factors on embryonic development; special emphasis on effects of diet, drugs and pesticides.

105. Caged Exotic Bird Management (3) I, Grau
Lecture—2 hours; discussion—1 hour. Prerequisite: upper division standing in a biological sciences major; course 100. Cage birds, as a unique set of birds, will be examined with respect to anatomy, behavior, breeding, physiology, nutrition, diseases, history, incubation, space and other environmental needs, and history of use by man. Relationships between poultry and cage bird business will be explored.

110. Comparative Avian Microanatomy (4) II, Ogasawara
Lecture—2 hours; laboratory—6 hours. Prerequisite: Zoology 2-2L and Physiology 110. Development and aging of specific organs and tissues unique to avian species will be studied in chickens, quail, turkeys and raptors, as well as mutants available at Davis. Comparisons will be made to reptiles and mammals in many cases.

120. Game Bird Production (3) I, Woodard
Lecture—2 hours; laboratory—3 hours. Prerequisite: Animal Science 1, 2; course 11. Introduction to husbandry of popular game bird species kept in captivity. Course will cover such basic factors as game bird identification, incubation, housing, brooding and rearing, nutrition, diseases, sanitation and marketing.

149. Environmental Management of Poultry (1) III, Ernst
Lecture—1 hour. Prerequisite: Physiology 149 (may be taken concurrently). Application of physiological principles to environmental management of poultry.

150. Comparative Nutrition of Avian Species (3) II, Vohra
Lecture—2 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1 and Chemistry 8A or consent of instructor. Comparison of digestive tracts, food habits, effects of nutrients on growth, sexual maturity, egg production, fertility and hatchability of eggs of wild and domestic species of birds. Effects of pesticides and other non-nutrient substances on their life cycles.

190. Proseminar in Avian Sciences (1) I, II, III, Kratzer, Weathers, Woodard
Seminar—1 hour. Prerequisite: upper division standing in avian sciences or consent of instructor.

192. Internship in Avian Sciences (1-12) I, II, III, The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of a minimum of 84 units; consent of instructor. Work-learn study 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. Problems in avian biology related to nutrition, breeding, and physiology of poultry and their products. (P/NP grading only.)

Graduate Courses

202L. Laboratory in Avian Experimental Embryology and Teratology (3) III, Abbott
Laboratory—9 hours. Prerequisite: consent of instructor. The causes of abnormal morphogenesis in avian embryos including genetic, chemical, and physical-environmental factors; the application of transplantation, organ culture, and other experimental techniques. Offered in odd-numbered years.

250. Advanced Poultry Nutrition and Feed Formulation (3) II, Kratzer, Vohra
Lecture—3 hours, including use of computer for least cost formulation. Prerequisite: Nutrition 121 or the equivalent. Nutrient requirements of growing and reproducing poultry as influenced by environmental factors. Evaluation of con-

ventional and nonconventional feedstuffs for dietary energy, protein quality, vitamins, minerals, growth promotants and toxicants. Use of computers for least cost formulations.

290. Seminar (1) I, II, III, The Staff (Chairperson in charge)
Seminar—1 hour. Reports and discussions of recent advances and selected topics of current interest in avian genetics, physiology, nutrition, and poultry technology.

297T. Supervised Teaching in Avian Sciences (1-4) I, II, III, The Staff (Chairperson in charge)
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.)

Bacteriology

(College of Letters and Science)

JaRue S. Manning, Ph.D., Chairperson of the Department

Department Office, 156 Hutchison Hall
(752-0262)

Faculty

Stanley W. Artz, Ph.D., Assistant Professor
3, 4 Paul Baumann, Ph.D., Associate Professor
Robert E. Hungate, Ph.D., Professor Emeritus
John L. Ingraham, Ph.D., Professor
3, 4 Sydney G. Kustu, Ph.D., Associate Professor
JaRue S. Manning, Ph.D., Associate Professor
Allen G. Marr, Ph.D., Professor
John C. Meeks, Ph.D., Assistant Professor
Herman J. Phaff, Ph.D., Professor (*Bacteriology, Food Science and Technology*)
David Pratt, Ph.D., Professor
Wiltraud P. Segel, Ph.D., Lecturer
Mortimer P. Starr, Ph.D., Professor
Mark L. Wheelis, Ph.D., Associate Professor

The Major Programs

The undergraduate major programs provide a balance of studies in the biology of bacteria and other microorganisms, together with appropriate courses in mathematics and physical science. Both the Bachelor of Arts and the Bachelor of Science programs are suitable for students who plan to do graduate work in a biological science or who wish a professional career in bacteriology.

Either major is appropriate for students contemplating a career in Medical Technology. Such students are advised to take Veterinary Microbiology 126 and 127, Clinical Pathology 101 and a one-year laboratory course in physics in addition to the courses required for a major in bacteriology.

Students majoring in Bacteriology in the College of Letters and Science may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis.

Choice of College. The Bachelor of Arts degree is offered only in the College of Letters and Science. The Bachelor of Science degree is offered in both the College of Letters and Science and the College of Agricultural and Environmental Sciences.

Bacteriology

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	50-53
Bacteriology 2 or 102, 3	4-5
Biological Sciences 1	5
Chemistry 1A, 1B, 1C, 5, 8A, 8B	25
Statistics 13	4
Mathematics 16A-16B or 21A-21B	6-8
Physics	6
Recommended: Physics 2A, 2B, 2C.	
Depth Subject Matter	36-39
Bacteriology 105, 130A; 106-106L or 120-120L or 130B-130L or 177-177L	13-14
Biochemistry 101A, 101B, 101L	11
Genetics 100A-100B or 120	4-6
Additional units from Bacteriology 120, 120L, 106, 106L, 130B, 130L, 150, 177, 177L; Biological Sciences 162; Botany 114, 118, 119; Veterinary Microbiology 127, 127L, 128	8
Total Units for the Major	86-92

Bacteriology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	50-54
Bacteriology 2 or 102, 3	4-5
Biological Sciences 1	5
Chemistry 1A, 1B, 1C, 5	19
Statistics 13	4
Mathematics 16A, 16B, 16C; or 21A, 21B, 21C	9-12
Physics 2A, 2B, 2C	9
Depth Subject Matter	53-57
Bacteriology 105, 130A; 106-106L or 120-120L or 130B-130L or 177-177L	13-14
Biochemistry 101A, 101B, 101L	11
Chemistry 107A, 107B, 128A, 128B, 128C, 129A	17
Genetics 100A-100B or 120	4-6
Biological Sciences 162 or Veterinary Microbiology 128	3-4
Additional units from Bacteriology 120, 120L, 106, 106L, 130B, 130L, 150, 177, 177L	5
Recommended: Chemistry 108; a course in computer programming.	
Total Units for the Major	103-111

Breadth Subject Matter

<i>College of Agricultural and Environmental Sciences students</i>	24
English and/or rhetoric	8
Social sciences and/or humanities	16
Additional requirements as described on page 70.	

College of Letters and Science students:
Refer to page 93 for a description of
requirements to be completed in
addition to the major.

Major Advisers. S.W. Artz, J.C. Meeks, W.P. Segel.

Honors and Honors Program. See major advisers listed above.

Teaching Credential Subject Representative. W.P. Segel. See page 105 for the Teacher Education Program.

Graduate Study. The Graduate Group in Microbiology offers programs of study and research leading to the M.A. and Ph.D. degrees in general microbiology, including bacteriology. The offerings of the Department of Bacteriology are augmented by courses and faculty of the Departments of Biochemistry and Biophysics, Botany, Food Science and Technology, Genetics, 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, Department of Bacteriology.

Related Courses. For other courses related to Bacteriology see course offerings in the Departments of Biological Sciences, Botany, Epidemiology and Preventive Medicine, Food Science and Technology, Medical Microbiology, Plant Pathology, Veterinary Microbiology.

Faculty of the Department of Bacteriology also teach or participate in the following courses: Biological Sciences 1, 162, Food Science and Technology 106; Veterinary Microbiology 128.

Courses in Bacteriology

Lower Division Courses

2. General Bacteriology (3) I, Starr; II, Marr, Segel; III, Segel Lecture—3 hours. Prerequisite: Biological Sciences 1. The biology of bacteria with some of its applications.

3. Bacteriological Laboratory Techniques (1) I, II, III. Segel Laboratory—3 hours. Prerequisite: Biological Sciences 1. Designed to acquaint student with basic techniques of bacteriology, with major responsibility for organizing and accomplishing work resting with student. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Manning in charge) Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

NOTE: Bacteriology 105 and 106 are designed for declared majors in Bacteriology and allied fields. Bacteriology 102 is primarily designed for Biological Sciences majors and other upper division and graduate students.

***101. Microbiology and Society** (4) I, Starr Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing and consent of instructor; introductory courses in biology and chemistry recommended. Microbes and microbiology, with particular attention to human welfare and experience. Nature and classification of microbes. Ways in which microbes aid, harm, and otherwise affect man, including environmental, literary, historical, intellectual, aesthetic, ethical, legal, economic, and political aspects. Limited enrollment.

102. General Bacteriology (4) I, Kustu, Baumann Lecture—4 hours. Prerequisite: Biological Sciences 1 and Chemistry 8B; Mathematics 16A recommended. Biology of bacteria and bacterial viruses. Survey course dealing with the physiology, genetics, and taxonomy of bacteria and their relation to man. Students who have had course 2 may receive only 2 units of credit for this course.

105. Bacterial Diversity: Morphology, Systematics, Habitats (5) I, Segel, Wheelis Lecture—3 hours; laboratory—6 hours. Prerequisite: courses 2 or 102, and 3; Chemistry 8B (or 128A and 129A). Major groups of prokaryotic organisms, with particular emphasis on morphology and natural history. Isolation of bacteria from various habitats by enrichment culture techniques.

***106. Bacterial Diversity: Metabolism Physiology** (3) II, Baumann Lecture—3 hours. Prerequisite: course 105, Biochemistry 101B (may be taken concurrently). Metabolic and physiological bases of prokaryotic diversity with particular emphasis on aerobic and anaerobic energy-yielding metabolism and the utilization of comparative biochemistry for classification of prokaryotes.

***106L. Laboratory in Physiological Basis of Bacterial Diversity** (2) II, Baumann Laboratory—6 hours. Prerequisite: course 106 (may be taken concurrently). Practical experience in isolation and characterization of prokaryotes using a number of different analytical methods. Offered in even-numbered years.

120. Microbial Ecology (3) III, Meeks Lecture—3 hours. Prerequisite: course 105, Biochemistry 101A. 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) II, Ingraham Lecture—3 hours. Prerequisite: course 2 or 102; Biochemistry 101B (may be taken concurrently); Genetics 100A; Mathematics 16A. The physiology and regulation of bacterial growth including the effect of the environment. Mapping techniques and the use of mutants in problem solving.

130B. Bacterial Physiology and Genetics (3) III, Artz 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—6 hours. Prerequisite: courses 3, 130A. 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.

150. Eukaryote Protistology: Yeasts (3) II, Phaff Lecture—3 hours. Prerequisite: course 2; Biochemistry 101A recommended. Diversity among eukaryotic protists with special emphasis on yeasts and yeast-like fungi and their relationships to the higher fungi. Selected fungi pathogenic to man.

150L. Laboratory in Eukaryote Protistology: Yeasts (1) II, Phaff Laboratory—3 hours. Prerequisite: courses 3, 150 (may be taken concurrently). Observation of morphology of cells and spores and selected yeasts and yeast-like fungi. Isolation and identification of selected yeasts from natural habitats. Nutritional experiments.

177. Metabolism of Anaerobic Bacteria (3) II, Macy (Animal Science) Lecture—3 hours. Prerequisite: course 2 or 102; Biochemistry 101B (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: courses 3, 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 odd-numbered years.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge) Laboratory—3-36 hours. Technical and/or professional experience on or off campus. Supervised by a member of the Bacteriology Department faculty. (P/NP grading only.)

197T. Tutoring in Bacteriology (1-5) I, II, III. The Staff (Ingraham in charge) Tutoring—1-5 hours. Prerequisite: course 3, and 18 upper division units in Bacteriology; 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 (Ingraham 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 (Manning in charge) Lecture—3 hours. Prerequisite: first-year graduate standing with interest in Bacteriology. A survey of general microbiology at the graduate level.

***205. Bacterial Diversity, Ecology and Systematics** (4) I, Starr Lecture-discussion—2 hours; laboratory—3 hours; term projects and papers. Prerequisite: consent of instructor. Intensive study of selected morphologically unusual bacteria and extreme habitats. Diversification elements of prokaryotes. Organismic associations. Principles and procedures of bacterial taxonomy.

***230. Bacterial Physiology** (2) III, Ingraham Lecture—2 hours. Prerequisite: course 130B, Biochemistry 101B. Selected topics in bacterial physiology. Offered in even-numbered years.

***250. Yeasts and Related Organisms** (5) I, Phaff, Miller Lecture—3 hours; laboratory—6 hours Prerequisite: consent of instructor. Morphology, development, classification,

and distribution of yeasts, relation to other fungi; growth requirements; physiological activities. Offered in odd-numbered years.

***260. Bacterial Genetic Regulatory Mechanisms** (3) II, 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 even-numbered years.

270. Advanced Animal Virology (3) III, Manning Lecture—3 hours. Prerequisite: consent of instructor. Selected advanced topics on biological and biochemical properties of animal viruses. May be repeated for credit.

280. Comparative Genetics of Prokaryotes (4) III, Ingraham, Wheelis Lecture-discussion—4 hours. Systems of genetic exchange, genome structure and genetic mapping techniques in bacteria. Emphasis on enteric bacteria, actinomycetes and pseudomonads.

291. Selected Topics in Bacteriology (1) I, II, III, Meeks, Wheelis Seminar—1 hour. Current progress in bacteriology and cellular and molecular biology. (S/U grading only.)

292. Seminar in Bacterial Physiology, Genetics and Virology (1) I, Baumann; II, Meeks; 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.)

296. Seminar in Animal Virology (1) II, Manning Seminar—1 hour. Prerequisite: consent of instructor. Discussion of current topics in animal virology. (S/U grading only.) (Same course as Veterinary Microbiology 292.)

298. Group Study (1-5) I, II, III. The Staff (Manning in charge) Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Manning in charge) (S/U grading only.)

Behavioral Biology

See Medicine

Biochemistry

(College of Agricultural and Environmental Sciences)

The Major Program

The Biochemistry major is suitable if you plan to pursue a professional career in biochemistry, to do graduate work in biochemistry or another biological science, or if you intend to apply to schools of medicine, dentistry, medical technology, or veterinary medicine. Students majoring in Biochemistry in the *College of Letters and Science* may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis.

Choice of College. The Bachelor of Science degree is offered in both the College of Agricultural and Environmental Sciences and College of Letters and Science.

Students working toward the bachelor's degree in Biochemistry may petition to receive credit towards the College of Letters and Science 64 upper division unit requirement for certain organic chemistry courses taken at other institutions which are judged equivalent to upper division courses offered at UC Davis. Further information can be obtained from the Division of Biological Sciences Office, 171 Mrak Hall.

Biochemistry

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
Preparatory Subject Matter	50-58
Biological sciences: Biological Sciences 1 and at least one course from Bacteriology 2-3 or 102-3, Botany 2, or Zoology 2-2L ...	10-11
Chemistry 1A-1B-1C, 5; or 4A-4B-4C (students may start with Chemistry 4A and continue with 1B-1C but not vice versa)	15-19
Mathematics 16A-16B-16C or 21A-21B-21C and one additional course in statistics (e.g., Statistics 13, 102, or 130A)	13-16
Physics, 12 units minimum (Physics 2A-2B-2C and 3A-3B-3C; or 8A-8B-8C)†	12
Depth Subject Matter	39-41
Biochemistry 101A-101B, 101L	11
Genetics 100A-100B or 120	4-6
Organic chemistry: Chemistry 128A-128B-128C-129A-129B-129C	15
Physical chemistry: Chemistry 107A-107B-108 or 110A-110B-110C	9
Breadth Subject Matter	32
<i>College of Agricultural and Environmental Sciences students</i>	
English 1, 2, 20, or 103; plus 4 additional units from the above or from English 3, 104, Rhetoric 1, 3, Comparative Literature 1, 2, 3, Philosophy 5 or 10	8
Social sciences and humanities (including foreign languages and additional English and rhetoric courses)‡	24
<i>College of Letters and Science students:</i> Refer to page 93 for a description of requirements to be completed in addition to the major.	
Restricted Electives	15
Upper division courses in biochemistry and related areas, to include at least three courses from Biochemistry 122, 133, 143, 153, and at least one additional lecture or laboratory course in a biological science. No more than 3 units of courses numbered 192, 197T, 198 or 199 may be used (check with adviser). Recommended: Biochemistry 190 and one upper division chemistry course.	
Unrestricted Electives (including 199, etc.)	34-44
Total Units for the Major	180

Major Adviser. I. H. Segel (*Biochemistry and Biophysics*).

Graduate Study. See page 99 and under Biochemistry (A Graduate Group), below.

Courses. See under Biochemistry and Biophysics.

Biochemistry (A Graduate Group)

Mark G. McNamee, Ph.D., Chairperson of the Group
Group Office, 149 Briggs Hall (752-3611)

Graduate Study. The Graduate Group in Biochemistry offers programs of study and research leading to the M.S. and Ph.D. degrees. For detailed information regarding graduate study, address the chairperson of the group.

Graduate Advisers. See *Class Schedule and Room Directory*.

Courses in Biochemistry

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.)

Biochemistry and Biophysics

(College of Agricultural and Environmental Sciences)

Jack Preiss, Ph.D., Chairperson of the Department
Department Office, 149 Briggs Hall (752-3611)

Faculty

- †George E. Bruening, Ph.D., Professor
- Sterling Chaykin, Ph.D., Professor
- Eric E. Conn, Ph.D., Professor
- †Richard S. Criddle, Ph.D., Professor
- Michael E. Dahmus, Ph.D., Associate Professor
- Roy H. Doi, Ph.D., Professor
- Marilynn E. Etzler, Ph.D., Professor
- Jerry L. Hedrick, Ph.D., Professor
- Lloyd L. Ingraham, Ph.D., Professor
- Mark G. McNamee, Ph.D., Associate Professor
- Jack Preiss, Ph.D., Professor
- Irwin H. Segel, Ph.D., Professor
- Larry R. Sprechman, Ph.D., Lecturer
- Paul K. Stumpf, Ph.D., Professor
- Merna R. Villarejo, Ph.D., Assistant Professor

Major Programs and Graduate Study. See the major in Biochemistry (page 154); and for graduate study see page 99, and under Biochemistry (A Graduate Group), this page.

Related Courses. See Food Science and Technology 210, 250, 251.

Courses in Biochemistry and Biophysics

Questions pertaining to the following courses should be directed to the instructor or to the Division of Biological Sciences, 150 Mrak Hall.

Upper Division Courses

- 101A. General Biochemistry** (3) I, II, III. Segel, Etzler, McNamee, Villarejo, Sprechman
Lecture—3 hours. Prerequisite: Chemistry 8B or 128B. Introduction to the chemistry and metabolism of biologically important compounds; dynamic aspects of biochemistry with examples from animals, plants and microorganisms.

- 101B. General Biochemistry** (3) I, II, III. Stumpf, Doi, Segel, Conn
Lecture—3 hours. Prerequisite: course 101A. A continuation of 101A.

- 101L. General Biochemistry Laboratory** (5) I, II, III. Criddle, Hedrick, Preiss, Bruening, Chaykin, Ingraham, Sprechman, Doi
Lecture—2 hours; laboratory—10 hours. Prerequisite: course 101B (may be taken concurrently); Chemistry 5. Introduction to laboratory methods and procedures employed in studying biochemical processes. Designed for students who require limited experience in the use of biochemical techniques as laboratory tools.

- 122. Plant Biochemistry** (3) II. Conn, Stumpf
Lecture—3 hours. Prerequisite: course 101B. The chemistry of important plant constituents and processes such as photosynthesis and respiration; carbohydrate, fat, and nitrogen metabolism.

- 123. An Introduction to Enzymology** (3) III. Whitaker (Food Science and Technology)
Lecture—3 hours. Prerequisite: course 101B. Principles of physical, chemical and catalytic properties of enzymes and their utilization. Experimental determination and quantitative evaluation of influence of reaction conditions on activity are stressed. Specificity and mechanism of action illustrated by consideration of selected enzymes.

- 123L. Enzymology Laboratory** (2) III. Whitaker (Food Science and Technology)
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 101B; course 123 (concurrently). Laboratory procedures involved in separation and study of enzymes.

- 133. Behavior and Analysis of Enzyme Systems** (3) III. Segel
Lecture—3 hours. Prerequisite: courses 101A and 101B. Introduction to enzyme kinetics and varieties of enzyme behavior, with emphasis on metabolic regulation. Topics include: steady-state kinetics, patterns of feedback inhibition, control by enzyme activation, allosteric enzymes, multireactant systems, enzyme assays, and membrane transport.

- 143. Structure-Function Relations of Proteins** (3) I, Hedrick, Villarejo
Lecture—3 hours. Prerequisite: courses 101A, 101B; and 101L (may be taken concurrently). 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.

- 153. Biosynthesis of Informational Macromolecules, Mechanisms and Regulation** (3) II. Dahmus
Lecture—3 hours. Prerequisite: course 101B; Genetics 100A. Chromosome structure and function in prokaryotic and eukaryotic systems. Mechanisms of nucleic acid and protein synthesis with special emphasis on regulation. Regulation at multicellular level; development, immune system and carcinogenesis.

- 190. Undergraduate Seminar in Biochemistry** (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: courses 101A, 101B (may be taken concurrently). Discussion of the historical developments of modern biochemistry.

- 192. Internship** (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Technical and/or practical experience on and off campus, supervised by a member of the Biochemistry and Biophysics faculty. (P/NP grading only.)

- 197T. Tutoring in Biochemistry** (1-5) I, II, III. The Staff (Chairperson in charge)
Discussion—1-5 hours. Prerequisite: upper division standing and consent of instructor. To assist the instructor by tutoring students in one of the department's regular courses. (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

- 201A. Physical and Chemical Biochemistry** (4) I, Bruening, Ingraham
Lecture—4 hours. Prerequisite: course 101B; Chemistry 107B-108 or 110C; 128C, 129C. Biochemical thermodynamics and chemical and physical properties of biomacromolecules, including enzyme kinetics and methods for determining size and shape of macromolecules.

†Physics 8D is optional. Students electing the Physics 8 sequence should elect Mathematics 21A-21B-21C and 22A-22B-22C.

‡Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

NOTE: For key to footnote symbols, see page 130.

201B. Metabolism and Bioenergetics (3) II. Chaykin
Lecture—3 hours. Prerequisite: course 201A. Intermediary metabolism of amino acids, nucleotides, lipids and carbohydrates; biological oxidation reduction reactions; photosynthesis and oxidative phosphorylation; roles of vitamins in metabolism; catalytic strategies of biosynthesis and biodegradation.

201C. Molecular Biology (3) III. Hershey, Criddle, Dahmus, Doi, Bradbury
Lecture—3 hours. Prerequisite: course 201B. 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.

201D. Integration of Metabolism and Regulatory Phenomena (2) III. Preiss, Freedland, Walsh
Lecture—2 hours. Prerequisite: course 201B or consent of instructor. Comprehensive discussion of various regulatory phenomena that occur in the control of metabolism; e.g., regulation at enzyme level; integration of metabolic pathways from the whole animal view including homeostasis, hormonal influences, turnover of enzymes, comparative aspects of metabolism and regulation of amino acid and lipid metabolism in mammals.

201E. Cellular Biochemistry (3) I, McNamee
Lecture—3 hours. Prerequisite: course 201A. 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.

202A-202B. Advanced Biochemistry Laboratory (6-6) I-II. The Staff
Lecture—1 hour; laboratory — 12 hours. Prerequisite: course 201A (may be taken concurrently); Chemistry 5. Laboratory methods and procedures used in biochemical research. Critical evaluation of experimental design and data is stressed. (S/U grading only.)

203. Carbohydrates (3) III. Preiss
Lecture—2 hours. Prerequisite: course 201B. Chemistry, metabolism, and biological functions of the various classes of carbohydrates and their polymers. Biosynthesis of simple and complex sugars and polysaccharides. Offered in even-numbered years.

204. Nucleic Acids (3) I, Bruening, Dahmus, Doi
Lecture—3 hours. Prerequisite: course 201C or consent of instructor. Physical and biological properties of nucleic acids; biosynthetic pathways; metabolism and structure of bases, nucleotides and their occurrence and distribution. Relation of structure and function of RNA and DNA to heredity, coding, and protein synthesis. Offered in odd-numbered years.

205. Biochemical Mechanisms (3) II. Ingraham
Lecture—3 hours. Prerequisite: course 101B or consent of instructor; Chemistry 110C, 131. Bond structure of biochemical interest. Application of modern organic and inorganic chemical principles to a study of the mechanisms of biochemical reactions.

206. Physical Biochemistry of Macromolecules (3) II. Criddle, McNamee
Lecture—3 hours. Prerequisite: course 201C or consent of instructor; Chemistry 110C. Application of modern physical concepts and experimental methods to the problems of large molecules of biological interest. Offered in even-numbered years.

207. Lipids (3) I, Stumpf
Lecture—3 hours. Prerequisite: course 201C or consent of instructor. Discussion of chemistry, metabolism and experimental methodology unique to fatty acids, triglycerides, phospholipids, plasmalogens, sphingolipids, carotenoids and steroids. Offered in even-numbered years.

208. Membrane Biochemistry (3) II. McNamee, Criddle
Lecture—3 hours. Prerequisite: courses 101B and 201C or consent of instructor. Membranes will be described initially in terms of their chemical composition and physical structures. Methods for analyzing membrane structure and function will then be considered. Finally many of the biological functions of membranes will be analyzed. Offered in odd-numbered years.

210. Protein Biochemistry (3) II.
Lecture—3 hours. Prerequisite: course 201C. Chemical, physical, and biological properties of amino acids, peptides, and proteins. The biological aspects include protein function, biosynthetic and biodegradative pathways, and nutritional requirements for amino acids.

212. Chemical Modifications of Proteins (3) III. Feeney (Food Science and Technology)
Lecture—3 hours. Prerequisite: course 101B, Chemistry 128C. Chemical approaches for studying proteins, empha-

sizing 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.

213. Principles of Comparative Biochemistry (3) I, Benisek (School of Medicine), Feeney (Food Science and Technology)
Lecture—3 hours. Prerequisite: course 201C or consent of instructor. An advanced treatment of comparative biochemistry. Comparisons of living systems, their structures and functions on a molecular basis, biochemical unity and diversity; protein structures and organized enzyme systems. Comparison of biochemical processes related to photobiology, metabolism, and excretion. Offered in odd-numbered years. (Same course as Biological Chemistry 213.)

215. Kinetics of Biological Systems (2) III. Ingraham
Lecture—2 hours. Prerequisite: course 201B; Fortran IV (may be taken concurrently). Kinetic behavior of multivariable biological systems; mathematical methods and analysis of typical data with accent on computer use; in particular, the kinetics of multivariant catalysts, pre-steady state systems, perturbed systems, and reactions in a metabolic sequence. Offered in even-numbered years.

225. Science, the Scientist, and Society (2) II. Hedrick
Discussion—2 hours. Prerequisite: two years of graduate work and consent of instructor. Readings and discussions on the attitudes and values of scientists about themselves, science, and society. Science, art and creativity; scientific explanation; organization and publication of science; basic versus applied research; axiology, antisience. Offered in even-numbered years.

230. Biochemical Aspects of Endocrinology (3) III. ——— (Animal Science).
Lecture—3 hours. Prerequisite: course 101B; a course in endocrinology or consent of instructor. Chemistry and function of animal hormones, with special reference to isolation and structure of those of vertebrate origin. Assay, mechanism of action, biosynthesis, and metabolism of hormones. Biochemical lesions in congenital and other endocrinopathies. Offered in odd-numbered years.

240. Selected Topics in Biochemistry (2) II. The Staff
Seminar—1 hour. Prerequisite: course 201C or consent of instructor. (S/U grading only.)

250. Biochemical Literature (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: course 201C or consent of instructor. Critical reading and evaluation of current biochemical literature. Selected papers will be presented and discussed in detail. (S/U grading only.)

270. Advanced Research Conference (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: course 201C or consent of instructor. Presentation and critical discussions of research activities of various members of local biochemical community; primarily designed for graduate students. (S/U grading only.)

291. Current Progress in Biochemistry (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: course 201C or consent of instructor. Seminars presented by guest lecturers on subject of their own research activities. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. Directed group study of special topics in biochemistry. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Biological Chemistry

See Medicine

Biological Sciences

(Intercollege Division)

Donald L. McLean, Ph.D., Dean, Division of Biological Sciences
—————, Associate Dean

Division Office, 171 Mrak Hall (752-0410)

Faculty

Faculty includes members from departments of Animal Physiology, Bacteriology, Biochemistry, Botany, Genetics, and Zoology; and academic advisers for divisional majors and instructors of upper division courses in curricula of divisional majors.

*Kathleen M. Fisher, Ph.D., Associate Professor
Wiltraud P. Segel, Ph.D., Lecturer

Programs of Study

The Division of Biological Sciences is an intercollege unit which coordinates the teaching and research of the departments of Animal Physiology, Bacteriology, Biochemistry, Botany, Genetics, and Zoology. Four majors leading to an A.B. degree are offered in Biological Sciences, Bacteriology, Botany, and Zoology. Seven majors are offered within the Division leading to a B.S. degree in disciplines of the six above-named departments, and in Biological Sciences. The major programs are described under the respective departmental listings, except for majors in Biological Sciences (outlined below).

Biological Sciences Major Programs

The major programs in Biological Sciences provide an opportunity for broader study of basic biology than is possible with most departmental majors. The programs provide suitable undergraduate 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. Students interested in a career involving considerable personal interactions, such as some of the health science areas, may be best served by the Bachelor of Arts program; for those interested in a more laboratory-oriented area, the Bachelor of Science program is more suitable.

Students majoring in Biological Sciences in the *College of Letters and Science* may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis.

Choice of College. The Bachelor of Arts degree is offered only in the College of Letters and Science. The Bachelor of Science degree is offered in both the College of Letters and Science and the College of Agricultural and Environmental Sciences.

Biological Sciences

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	42-48
Bacteriology 2 or 102, 3	4-5
Biological Sciences 1	5
Botany 2	5
Zoology 2-2L	6
Chemistry 1A, 1B	10
Chemistry 8A-8B or 128A-128B-128C-129A	6-11
Mathematics and statistics	6
Recommended: Chemistry 1C; Physics 2A, 2B, 2C.	

Depth Subject Matter	36
Genetics 100A-100B or 120	4-6
Restricted Electives , sufficient to achieve a total of 36 upper division units in the biological sciences, and to include at least one course from two of the three Area lists (animal biology, microbiology, plant biology) shown below; and at least one course from each of the five Group Requirement lists, a through e, shown below. (A course that appears on both the Area and Group Requirement lists below may be used to satisfy <i>both</i> requirements. Both halves of sequential courses connected by a hyphen must be taken.)	30-32
Total Units for the Major	78-84

Breadth Subject Matter

College of Letters and Science students:
Refer to page 93 for a description of requirements to be completed in addition to the major.

Biological Sciences**B.S. Major Requirements:**

Preparatory Subject Matter	63-69
Bacteriology 2 or 102, 3	4-5
Biological Sciences 1	5
Botany 2	5
Chemistry 1A-1B-1C or 4A-4B-4C	15
Chemistry 8A-8B or 128A-128B-128C-129A	6-11
Mathematics 16A, 16B, 16C	9
Physics 2A, 2B, 2C	9
Statistics 13 or 102	4
Zoology 2-2L	6
Recommended: Chemistry 5, Physics 3A, 3B, 3C.	
Depth Subject Matter	45
Biochemistry 101A-101B, or Physiological Sciences 101A-101B	6-7
Genetics 100A-100B or 120	4-6

Restricted Electives , sufficient to achieve a total of 45 upper division units in the biological sciences, and to include at least one course from each of the three Area lists (animal biology, microbiology, plant biology) shown below; and at least one course from each of the five Group Requirement lists, a through e, shown below. (A course that appears on both the Area and Group Requirement lists below may be used to satisfy <i>both</i> requirements. Both halves of sequential courses connected by a hyphen must be taken.)	32-35
Total Units for the Major	108-114

Breadth Subject Matter

<i>College of Agricultural and Environmental Sciences students</i>	24
English and/or rhetoric	8
Social sciences and/or humanities	16
Additional requirements as described on page 70	
<i>College of Letters and Science students:</i> Refer to page 93 for a description of requirements to be completed in addition to the major.	

Course List for Area Requirement

- (a) Animal Biology: Anatomy 100; Anthropology 151, 152, 153, 154A, 155, 156; Avian Sciences 100; Entomology 101A, 101B, 103, 104, 106, 109, 116, 119, 121; Geology 111A; Human Anatomy 101; Wildlife and Fisheries Biology 110, 120, 140, 151; Zoology 100, 105, 106, 110, 112A, 112B, 116, 125, 133A, 133B, 136, 137, 138, 147, 148, 149, 155.
- (b) Microbiology: Bacteriology—all upper division courses except Bacteriology 101; Biological Sciences 162; Botany 114, 118, 119; Entomology 156; Geology 111B; Medical Microbiology 107; Plant Pathology 120, 130; Veterinary Microbiology 126, 127, 128, 132.
- (c) Plant Biology: Botany 101, 102, 105, 108, 114, 116, 117, 118, 119, 120, 121, 122, 140, 141, 142, 190; Environmental Horticulture 105, 107; Plant Science 101, 103; Range Management 100; Resource Sciences 110.
- Note:** Botany 114, 118, or 119 may be used for either microbiology or plant biology (not both).

Course List for Group Requirement

- (a) Organismal Biology: Bacteriology 105, 150; Biological Sciences 162; Botany 102, 105, 108, 114, 116, 118, 119; Entomology 101A, 101B, 103; Veterinary Microbiology 127; Zoology 100, 105, 106, 112A, 112B, 133A, 133B, 136, 137.
- (b) Population Biology and Ecology: Anthropology 154A; Botany 117, 141; Entomology 104; Environmental Studies 100, 121; Genetics 105; Geology 116, 150C; Wildlife and Fisheries Biology 110, 151; Zoology 125.
- (c) Evolutionary Biology: Anthropology 151, 152; Botany 140; Genetics 103; Geology 107; Plant Science 103; Zoology 148.
- (d) Physiology: Bacteriology 130A-130B; Botany 111A-111B; Physiology 110; Plant Pathology 130; Zoology 142, 143, 144. Bachelor of Arts majors may satisfy the Physiology group requirement with Biochemistry 101A-101B.
- (e) Molecular and Cell Biology: Biochemistry 133, 143, 153; Botany 130; Genetics 102; Medical Microbiology 107; Physiology 100A-100B, 103; Veterinary Microbiology 126; Zoology 121A, 121B, 166.

Other Upper Division Courses

A list of courses which will be accepted in satisfaction of the upper division major requirement, without petitioning, is available in the Division of Biological Sciences Office, Room 150, Mrak Hall.

There is a limitation of variable-unit courses which may be counted towards the major: 2 units of 197T; 4 to 6 units of 199 (including the 2 units of 197T).

Major Advisers. Contact Division Office for adviser assignments.

Minor Program Requirements:

The minor in Biological Sciences is designed to acquaint students with the range and variety of modern biology, including work in two of three areas: animal biology, plant biology, and microbiology, and in four of the following five subdisciplines: organismal biology, ecology, evolution, physiology, and cell-molecular biology. The list of required courses is restricted to those which 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 Office. (Note: this program is only available to students in the College of Letters and Science.)

Biological Sciences	22-24
Genetics 120 or 100A-100B	4-6
Additional upper division units to include	18

Area Requirements

Courses in two of the three areas: Animal Biology, Microbiology, and Plant Biology. An extensive list of courses which will satisfy area requirements can be found under the Biological Sciences major program description above. (*Courses can be used to simultaneously satisfy both the area and group requirements.*)

Group Requirements

At least one course or course sequence must be selected from four of the following five groups

- a) *Organismal biology:* Bacteriology 105, Botany 102, 105, 114, 116, Zoology 100, 106, 112A, 112B, 136, 137
- b) *Ecology:* Anthropology 154A, Botany 101, Environmental Studies 100, Geology 116, Wildlife and Fisheries Biology 151, Zoology 125
- c) *Evolution:* Anthropology 151, Botany 140, Genetics 103, Geology 107, Zoology 148, 149
- d) *Physiology:* Botany 111A-111B, Physiology 110
- e) *Cell and molecular biology:* Biochemistry 101A-101B, Botany 130, Physiology 100A-100B

Teaching Credential Subject Representative. Associate Dean (Biological Sciences). See page 105 for the Teacher Education Program.

Courses in Biological Sciences**Lower Division Courses**

1. Principles of Biology (5) I, Murphy (Botany); II, Pratt (Bacteriology); III, Wolfe (Zoology)

Lecture—4 hours; OR lecture—2 hours plus autotutorial—2 hours. Prerequisite: Chemistry 1B. An interdisciplinary course designed for majors in the biological sciences. The emphasis is on the unity of basic biological principles as related to cell structure and function, reproduction, genetics, evolution, and ecology.

10. General Biology (4) I, Metcalf (Zoology); II, Ketelapper (Botany)

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 1.

12. Human Sexuality (2) I, Hildebrand (Zoology)

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.)

19. Biology of Cancer (3) III.

Lecture—3 hours. Prerequisite: either course 1 or 10, or Genetics 10, or Physiology 10 recommended. 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.

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

115. Problems in Marine Biology (15) III. Phillips (Zoology) Full-time study at Bodega Marine Laboratory. Prerequisite: consent of instructor based on adequate preparation for topic under consideration, i.e., appropriate laboratory courses in invertebrate zoology (normally Zoology 112A or 112B), microbiology (normally Bacteriology 105 or 120), paleontology, geology, or botany; junior standing. Lecture, laboratory and field work, and directed study of a selected focal topic in marine biology, stressing experience in original research. Offered depending upon availability of instructors. Limited enrollment.

162. General Virology (4) I, Pratt (Bacteriology); Shalla (Plant Pathology); Bruening (Biochemistry); Manning (Bacteriology)

Lecture—4 hours. Prerequisite: course 1; Genetics 100A and Biochemistry 101B recommended. An integrated presentation of the nature of animal, bacterial, and plant viruses, including their structure, replication and genetics.

197T. Tutoring in Biological Sciences (1-5) I, II, III. The Staff Prerequisite: upper division standing with major in a Biological Sciences. Assisting in courses 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

***210. Effective Teaching of College Biology (2) III.** Fisher 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.)

***211. Designing Instruction in the Biological Sciences (3) II.** Fisher

Lecture—1 hour, laboratory—6 hours. Prerequisite: graduate standing. Students will each develop a unit of biological science instruction (such as a lecture, laboratory experiment, syllabus, text chapter, audiovisual module). Will consider goals; objectives; selection of appropriate pedagogical strategies, methods, and source materials; organization; development; and evaluation.

***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.

Biomedical Engineering (A Graduate Group)

James F. Shackelford, Ph.D., Chairperson of the Group

Group Office, 2020 Bainer Hall
(Mechanical Engineering), (752-0580/2842)

Faculty

Robert El. Smith, Ph.D. (*Human Physiology*)
Richard F. Walters, Ph.D., Associate Professor
(*Human Physiology*)

Worden Waring, Ph.D., Professor (*Physical Medicine and Rehabilitation, Human Physiology*)

Graduate Study. The Graduate Group in Biomedical Engineering offers a program of study and research leading to the Ph.D. degree. For detailed information regarding graduate study in biomedical engineering address the chairperson or adviser of the group.

Graduate Adviser. R.E. Curry (*Human Physiology*).

Courses in Biomedical Engineering

Graduate Courses

252. Advanced Information Systems (3) II, Walters
Lecture—2 hours; laboratory—2 hours. Prerequisite: experience in initial phases of data preparation, editing and sorting; Community Health 151 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. (Same course as Community Health 252.)

290. Seminar (2) I, II, III. The Staff (Chairperson in charge)
Seminar—2 hours. Special topics in biomedical research and applications. Includes such topics as instrumentation, simulation and modeling, physiological and computer applications, artificial organs and assistive devices. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
(S/U grading only.)

Botany

(College of Letters and Science)

Kenneth Wells, Ph.D., Chairperson of the Department

David E. Bayer, Ph.D., Vice Chairperson,
Agricultural Botany

Department Office, 143 Robbins Hall (752-0617)

Faculty

Fredrick T. Addicott, Ph.D., Professor Emeritus
Floyd M. Ashton, Ph.D., Professor
Daniel I. Axelrod, Ph.D., Professor Emeritus
Michael G. Barbour, Ph.D., Professor
David E. Bayer, Ph.D., Professor
Bruce A. Bonner, Ph.D., Associate Professor
Paul A. Castelfranco, Ph.D., Professor
Alden S. Crafts, Ph.D., LL.D., Professor Emeritus

Herbert B. Currier, Ph.D., Professor Emeritus
James A. Doyle, Ph.D., Associate Professor
Emanuel Epstein, Ph.D., Professor (*Botany, Plant Nutrition*)

Richard H. Falk, Ph.D., Associate Professor

^{3,4}Ernest M. Gifford, Jr., Ph.D., Professor

Hendrik J. Ketellapper, Ph.D., Professor

Donald W. Kyhos, Ph.D., Professor

Norma J. Lang, Ph.D., Professor

Francis T. Lichtner, Ph.D., Assistant Professor

William J. Lucas, Ph.D., Assistant Professor

Jack Major, Ph.D., Professor

Terence M. Murphy, Ph.D., Associate Professor

Robert F. Norris, Ph.D., Associate Professor

Robert W. Pearcy, Ph.D., Associate Professor

¹Steven R. Radosevich, Ph.D., Associate Professor

Thomas L. Rost, Ph.D., Associate Professor

Alan J. Stemler, Ph.D., Assistant Professor

C. Ralph Stocking, Ph.D., Professor Emeritus

Robert M. Thornton, Ph.D., Associate Professor

John M. Tucker, Ph.D., Professor

Grady L. Webster, Ph.D., Professor

T. Elliott Weier, Ph.D., Professor Emeritus

Kenneth Wells, Ph.D., Professor

The Major Programs

Study leading to Bachelor of Arts or Bachelor of Science degrees in Botany covers several specialized areas: anatomy (internal plant structure), cytology (cellular structure and function), morphology (external plant form), physiology (plant function), taxonomy (plant classification), ecology (plant and environmental relationships), paleobotany (fossil plants), and studies of specific plant groups such as phycology (algae) and mycology (fungi). In addition, the department is a center for the study of weed science and herbicide physiology.

Botanists may teach, conduct research, or perform administrative duties. Many botanists perform public service jobs, such as in conservation organizations. Plant scientists who have specialized in one of the applied botanical areas, such as forestry or horticulture, are usually involved in administration and/or research. Most botanists are employed by educational institutions, governmental agencies and industrial firms. The U.S. Department of Agriculture and the U.S. Forest Service employ many botanists. Some find employment with the pharmaceutical, petroleum or chemical industries, seed companies, fruit growers, and food companies. Because we are more aware of the need for the control and management of our environment, the necessity for trained environmentalists and ecologists will probably continue to increase.

Students who wish a less intensive program in botany than that offered by the two Bachelor of Science major options, but one that acquaints a student with plant life and its importance, should elect the Bachelor of Arts major program.

Students majoring in Botany in the *College of Letters and Science* may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis.

Choice of College. The Bachelor of Arts degree is offered only in the College of Letters and Science. The Bachelor of Science degree is offered in both the College of Letters and Science and the College of Agricultural and Environmental Sciences.

Botany

A.B. Major Requirements

	UNITS
Preparatory Subject Matter	34-36
Biological Sciences 1	5

Botany 2	5
Chemistry 1A, 1B, 8A, 8B	16
Statistics 13 or 102	4
Zoology 2-2L; or Bacteriology 2 or 102, 3; or Geology 3-3L	4-6

Depth Subject Matter

Botany 102 or 108, 105, 111A, 111B, 114, 116 or 140, 117	40-42 28-29
Genetics 120	4
Additional upper division units in Botany or related natural science courses	8-9

Total Units for the Major 74-78

Recommended

Botany 118, 119; Chemistry 1C.
For students with interests in specialized areas of botany (e.g. agricultural botany, ecology, systematics and evolution, morphology, plant physiology, etc.) certain substitutions, including courses in other departments, may be allowed on prior consultation with a botany major adviser.

B.S. Major Requirements:

Option I: For those who plan (a) advanced study in some areas of botany or a related discipline, (b) to obtain a general secondary teaching credential, or (c) training for a position requiring a detailed knowledge of plants.

	UNITS
Preparatory Subject Matter	54-61
Biological Sciences 1	5
Botany 2	5
Chemistry 1A, 1B, 1C	15
Chemistry 8A-8B or 128A-128B-128C-129A	6-11
Physics 2A, 2B, 2C	9
Mathematics 16A, 16B	6
Zoology 2-2L; or Bacteriology 2 or 102, 3; or Geology 3-3L	4-6
Statistics 13 or 102	4

Depth Subject Matter

Biochemistry 101A, 101B	47-49
Genetics 120 or 100A-100B	4-6
Botany 105, 108, 111A, 111B, 111L, 116, 117, 118, 119	37

Total Units for the Major 101-110

Recommended

Botany 199 (3-5 units); German, French or Russian. For students with interests in specialized areas of botany (e.g., agricultural botany, ecology, systematics and evolution, morphology, plant physiology, etc.), certain substitutions, including courses in other departments, may be allowed on prior consultation with a botany major adviser.

Option II: For those who plan advanced study in physiology and/or biochemistry of plants

	UNITS
Preparatory Subject Matter	56-68
Biological Sciences 1	5
Botany 2	5
Chemistry 1A-1B-1C-5 or 4A-4B-4C	15-19
Chemistry 8A-8B or 128A-128B-128C-129A	6-11
Mathematics 16A-16B-16C or 21A-21B-21C	9-12
Physics 2A-2B-2C and 3A-3B-3C or 8A-8B-8C	12
Statistics 13 or 102	4

Depth Subject Matter

Biochemistry 101A, 101B, 101L, 122	50-53
Botany 105, 111A, 111B, 111L	14
Genetics 120	4
Chemistry 107A, 107B	6

One course each in three of the following four areas

- Taxonomy and evolution: Botany 102, 108
- Morphology and cytology: Botany 116, 130-130L, 140
- Phycology and mycology: Botany 114, 118, 119
- Ecology: Botany 117

Total Units for the Major 106-121

Recommended

Botany 199 (3-5 units); German, French, or Russian; Engineering 5 or Mathematics 29.

Certain substitutions, including courses in other departments, may be allowed on prior consultation with the botany major adviser.

Breadth Subject Matter

College of Agricultural and Environmental Sciences students 24
 English and/or rhetoric 8
 Social sciences and/or humanities 16
 Additional requirements as described on page 70

College of Letters and Science students:
 Refer to page 93 for a description of requirements to be completed in addition to the major.

Major Advisers: W.J. Lucas, R.H. Falk, A.J. Stemler (for A.B. and B.S., Option I); P.A. Castelfranco (B.S., Option II).

Minor Program Requirements:

UNITS
Botany 23

To satisfy the requirements for a Botany minor, a student must complete Botany 2 (or equivalent introductory botany course) 5
 Upper division units including at least one course from each of the four groups 18
 (a) Structural botany: Botany 105, 114, 116, 118, 119, 130
 (b) Physiological botany: Botany 111A, 111B, Plant Science 102
 (c) Ecological botany: Botany 101, 117, 141, Zoology 149
 (d) Systematics and evolution: Botany 102, 108, 114, 116, 118, 119, 140

Botany 114, 116, 118 and 119 may be offered satisfaction of either group (a) or (d) above. However, a single course may not satisfy both groups' requirements.

Minor Adviser. Same as for Major above.

Honors and Honors Program. Students on the honors 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 highest honors at graduation are not dependent on the completion of 194H. See pages 71 and 97 for Dean's Honors List information.

Teaching Credential Subject Representative. See page 105 for the Teacher Education Program.

Graduate Study. Graduate programs leading to M.S. and Ph.D. degrees are offered in cytology, plant physiology, anatomy, morphology, taxonomy, ecology, mycology, phycology, and allied areas. The resources of the department are augmented by appropriate courses in related departments.

Courses in Botany

Lower Division Courses

2. Introductory Survey of Botany (5) I, Kyhos; II, Rost; III, Thornton
 Lecture—3 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1, especially for mitosis, meiosis, cell structure, enzyme action, DNA, respiration, and photosynthesis. Broad survey of diversity in plant structure, function and classification. Special emphasis on flowering plants.

***90. Freshman Seminar in Plant Biology** (2) I, II, III. The Staff Seminar—2 hours. Prerequisite: consent of instructor. Selected topics on questions of current interest chosen to illustrate the nature and achievements of research in plant biology. (P/NP grading only.)

***91. Current Issues in Plant Biology** (2) I, Barbour, Bayer Seminar—2 hours. Prerequisite: consent of instructor. Basic concepts and methods of plant biology. Fundamental problems, recent trends in research, relationships with other fields of study. Topics to be announced quarterly. May be repeated for credit. (P/NP grading only.)

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
 Laboratory—3-36 hours. Prerequisite: consent of instructor.

Technical and/or professional experience on or off campus. Supervised by a member of the Botany Department 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.)
 Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Survey of Plant Communities of California (3) III. Barbour
 Lecture—2 hours; weekend field trips—4 to 8 days. Prerequisite: upper division standing and consent of instructor; course 2 recommended. Structure of selected plant communities and the relationship of the component species to the environment. Recommended for non-majors.

102. California Floristics (4) III. Webster
 Lecture—2 hours; laboratory—6 hours or field trips. Prerequisite: course 2 or an equivalent plant science course. Survey of the flora of California, with emphasis on practical identification of the important plant families, genera, and species characterizing the major floristic regions. Lectures emphasize the historical and ecological factors influencing the development of the California flora.

105. Plant Anatomy (5) I, Rost
 Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: course 2. Structure in relation to function of cells, tissues and organs of higher plants; discussions of current experimental literature.

108. Systematic Botany of Flowering Plants (5) III. Tucker
 Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. 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.

111A. Introduction to Plant Physiology (3) I, Stemler; II, Lucas
 Lecture—3 hours. Prerequisite: course 2; Chemistry 8B (may be taken concurrently). Fundamental activities of plants; the plant cell as a functioning unit. The processes of absorption, movement and utilization of water and minerals. Water loss, translocation, photosynthesis.

111B. Introduction to Plant Physiology (3) II, Bonner; III, Murphy
 Lecture—3 hours. Prerequisite: course 111A; Biochemistry 101A recommended. Continuation of course 111A. Respiration; metabolism. The dynamics and control of growth and development.

111L. Introductory Plant Physiology Laboratory (3) II, Lichtner
 Discussion—1 hour; laboratory—6 hours. Prerequisite: course 111B. An introduction into basic instrumentation and techniques used in the investigation of plant physiological processes such as water and solute absorption, movement, and utilization; translocation; transpiration; photosynthesis; respiration; growth; development and reproduction.

114. Biology of Fungi and Algae (5) III. Lang, Wells
 Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Not open for credit to students having received credit for courses 118 or 119. An introduction to the morphology, taxonomy, evolution, and physiology of the fungi and algae.

116. Biology of Vascular Plants (4) II.
 Lecture—2 hours; laboratory—6 hours. Prerequisite: course 2; course 105 recommended. Structure, ontogeny and reproduction of selected vascular plants; emphasis given to ferns and seed plants; preparation of fern cultures and fossil "peels"; one optional all-day field trip.

117. Plant Ecology (4) I, Barbour; III, Major.
 Lecture—3 hours; several Friday or Saturday field trips. Prerequisite: plant physiology (course 111B) and plant identification (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 may not receive credit for course 101.

118. Phycology (5) II. Lang
 Lecture—3 hours; laboratory—6 hours; one field trip. Prerequisite: course 2. Comparative morphology, physiology and development of major phyla (including blue-green algae) with emphasis on phylogeny in Chlorophyta; laboratory exercises stress identification and culturing. Environmental significance and exploitation of freshwater and marine forms considered.

119. Introductory Mycology (5) I, Wells
 Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2 or Bacteriology 2 and 3. Introduction to structure, ontogeny, and taxonomy of selected species of the major divisions of the fungi.

120. Introduction to Weed Science (3) II. Bayer
 Lecture—2 hours; demonstration-discussion—3 hours. Prerequisite: course 2; 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. Slight identification of common weeds and demonstrations to illustrate the principles.

121. Biology of Weeds (3) III. Radosevich
 Lecture—2 hours; laboratory—3 hours. Prerequisite: course 2. Origin and evolution, beneficial and harmful aspects, reproduction of 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.

122. Action of Herbicides (3) III. Ashton
 Lecture—2 hours; laboratory—3 hours. Prerequisite: course 120; Soil Science 2; courses 111A, 111B 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.

130. General Cytology (4) I, Falk
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or Zoology 2-2L; Genetics 100B or Biochemistry 101A. An analysis of the structure and ultrastructure of cells; the relationship between structure and function at cellular and sub-cellular levels. Consideration of cell particulates, membranes, endoplasmic reticulum, mitochondria, plastids, the Golgi region and their relation to both the metabolic nucleus and the dividing nucleus. Should not be taken by Biological Sciences majors to satisfy the Biological Sciences requirement in Plant Biology.

130L. General Cytology Laboratory (2) I, Falk
 Laboratory—6 hours. Prerequisite: course 130 (may be taken concurrently). Introduction to the laboratory methods of cytology; introduction to the interpretation of electron micrographs.

140. Introductory Paleobotany (4) II. Doyle
 Lecture—3 hours; laboratory—3 hours. Prerequisite: course 2. 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.

141. Plant Geography (4) II. Webster
 Lecture—3 hours; laboratory-discussion—3 hours. Prerequisite: course 102, 108, or 116, or consent of instructor; course 117 recommended. Analysis of the distribution patterns of the vascular plant groups, and consideration of the factors which account for the present diversity of the flora and vegetation.

***142. Cenophytic Paleobotany and Angiosperm Evolution** (4) III. Doyle
 Lecture—3 hours; laboratory—3 hours. Prerequisite: course 108 or 116 or 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.

143. Palynology (4) I, Doyle
 Lecture—2 hours; laboratory—6 hours. Prerequisite: course 108 or 116 or 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.

***155. Plant Microtechnique** (4) III.
 Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: course 105 or 116. Practical laboratory methods in preparing plant materials for microscopic examination; special emphasis given to paraffin and chromosome squash techniques; introduction to cryostat sectioning, histochemistry and photomicrography.

***190. Proseminar in Plant Biology** (2) II. Wells
 Seminar—2 hours. Prerequisite: upper division standing. Integration of concepts in plant biology. Selected topics include current research trends, relations with other disciplines, and topics of current interest in the theory, philosophy, history, and sociology of science. Topics to be announced quarterly. May be repeated for credit. (P/NP grading only.)

NOTE: For key to footnote symbols, see page 130.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Laboratory—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 Botany Department faculty. (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 (P/NP grading only.)

197T. Tutoring in Botany (1-5) I, II, III. The Staff

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. (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

202. Plant Ecophysiology (3) III. Pearcy
Lecture—3 hours. Prerequisite: courses 111A, 111B, 117, and consent of instructor. Study of the mechanisms of physiological adaptation of plants to their environment.

203. Ecophysiological Methods (3) III. Pearcy
Lecture—1 hour; laboratory—4 hours; project; one Saturday field trip to be arranged. Prerequisite: courses 111A, 117, and consent of instructor. A laboratory and lecture course covering basic concepts underlying the research methods and instrumentation useful in plant ecophysiology.

205A. Advanced Plant Physiology (3) I, Lucas
Lecture—3 hours. Prerequisite: course 111B; Chemistry 107A or consent of instructor. Cellular physiology, plant water relations, translocation and membrane transport.

205B. Advanced Plant Physiology (3) II. Castelfranco
Lecture—3 hours. Prerequisite: course 111B, Biochemistry 101B. Photosynthesis, respiration, and general plant metabolism.

205C. Advanced Plant Physiology (3) III. Bonner
Lecture—3 hours. Prerequisite: course 111B, Biochemistry 101A; courses 205A and 205B, Biochemistry 101B recommended. Internal and environmental regulation of plant growth and development.

206A. Advanced Plant Physiology Laboratory (3) I, 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) II. Castelfranco
Laboratory—9 hours. Prerequisite: course 205B (may be taken concurrently); Biochemistry 101L. Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 205B.

206C. Advanced Plant Physiology Laboratory (3) III. Bonner
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.

***212. Physiology of Herbicidal Action** (3) II. Ashton
Lecture—3 hours. Prerequisite: courses 111B, 122. Study of the fundamental processes involved in the physiological action of herbicides. Detailed consideration of the fate of herbicides in plants.

***215. Light and Plant Growth** (3) I, Bonner
Lecture—3 hours. Prerequisite: courses 205A, 205B, 205C; Physics 2C. Mechanisms and phenomena involved in the control of plant growth by light. Photoperiodism, photomorphogenesis, phototropism, and certain aspects of photosynthesis.

***217. Concept and Measurement of the Plant Community** (3) I, Barbour
Seminar-discussion—3 hours. Prerequisite: course 117 and a course in statistics. Major subject areas are: 1) historical concepts of the plant community and of hierarchical groupings of communities, and 2) a review of sampling and analytical methods employed in the description of measurements of plant communities.

***220. Plant Morphogenesis** (3) III. Rost
Lecture—3 hours. Prerequisite: course 105 or 116. Survey of recent advances in the study of growth and the development of form, with special reference to higher plants, and some emphasis on experimental approaches.

***220L. Plant Morphogenesis Laboratory** (2) III. Rost
Laboratory—6 hours. Prerequisite: course 220 (may be taken concurrently) and consent of instructor. Procedures, principally experimental, used to study the development of plant form.

221. Special Topics in Plant Physiology (2) I, Keteilapper; III, Castelfranco
Seminar—2 hours. Analysis in depth of recent advances in plant physiology. Lectures and discussions by research specialists. Term paper integrating and analyzing lectures. May be repeated for credit. (S/U grading only.)

222. Special Topics in Plant Morphology, Systematics, and Ecology (2) II. Pearcy
Seminar—2 hours. Analysis in depth of recent advances in plant structure and evolution. Lectures and discussions by research specialists. Term paper integrating and analyzing lectures. May be repeated for credit. (S/U grading only.)

231. Biological Electron Microscopy (1) II, Falk
Lecture—1 hour. Prerequisite: consent of instructor. An introduction to biological microscopy. Areas covered are: electron optics, electron specimen interactions, and vacuum systems.

231L. Biological Electron Microscopy Laboratory (3) II, Falk
Laboratory—9 hours. Prerequisite: consent of instructor, course 231 (may be taken concurrently). An introduction to biological electron microscopy. Areas covered are: specimen preparation and microscope operation. Limited enrollment.

***245. Pollination Ecology** (4) III. Thorp (Entomology), Webster
Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: consent of instructors. Theory of ecological relationships between plants and their pollinators with emphasis on insect pollination. Review of adaptations of both flowers and insects, and survey of the coevolution of pollination relationships. Offered in even-numbered years. (Same course as Entomology 245.)

***255. Principles of Plant Taxonomy** (4) I, Tucker
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 108; Genetics 103 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: course 108; course 117 and Genetics 103 recommended. Application of experimental techniques to the elucidation of taxonomic problems and evolutionary relationships in higher plants.

***256B. Experimental Plant Taxonomy** (2) III, Kyhos
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 256A. A continuation of course 256A. Study of variation in natural population 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.

257. Plant Autecology (3) I, Major
Lecture—3 hours. Prerequisite: course 117, Statistics 13. Evaluation of biotic and abiotic environmental factors in the distribution of plant species.

258. Plant Synecology (3) III, Major
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 108, 117; Soil Science 120 recommended. Theories and techniques involved in the study of structure, composition, boundaries, ecology, and classification of vegetation, with particular emphasis on California plant communities.

290. Seminar (1) I, Ashton; II, Tucker; III, Castelfranco.
Seminar—1 hour. (S/U grading only.)

291. Seminars in Botany (1) I, Bonner; II, III, Epstein
Seminar—1 hour. 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); III, Wells
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 Botany (1-5) I, II, III. The Staff
Prerequisite: graduate standing and consent of instructor. Designed for graduate students who desire teaching experience, but are not teaching assistants. (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.)

Cantonese

See Asian American Studies

Chemistry

(College of Letters and Science)

Peter A. Rock, Ph.D., Chairperson of the Department

Richard E. Kepner, Ph.D., Vice-Chairperson of the Department

Department Office, 108 Chemistry Building
(752-0503/0953)

Faculty

Thomas L. Allen, Ph.D., Professor
Lawrence J. Andrews, Ph.D., Professor
Alan L. Balch, Ph.D., Professor
Albert T. Bottini, Ph.D., Professor
Theodore G. Brown, Ph.D., Assistant Visiting Professor

Robert K. Brinton, Ph.D., Professor Emeritus
David A. Case, Assistant Professor

Joyce T. Doi, Ph.D., Lecturer
William H. Fink, Ph.D., Associate Professor

Edwin C. Friedrich, Ph.D., Professor
Sevgi S. Friedrich, Ph.D., Lecturer

Hakon Hope, Cand. real. Professor
Raymond M. Keefer, Ph.D., Professor

Joel E. Keizer, Ph.D., Professor
Richard E. Kepner, Ph.D., Professor

Mark J. Kurth, Ph.D., Assistant Professor
³Gerd N. LaMar, Ph.D., Professor

⁴August H. Maki, Ph.D., Professor
Gerald B. Matson, Ph.D., Assistant Adjunct Professor

Donald A. McQuarrie, Ph.D., Professor
Claude F. Meares, Ph.D., Associate Professor

R. Bryan Miller, Ph.D., Associate Professor
W. Kenneth Musker, Ph.D., Professor

Charles P. Nash, Ph.D., Professor
Edgar P. Painter, Ph.D., Professor Emeritus

Harold G. Reiber, Ph.D., Professor Emeritus
Peter A. Rock, Ph.D., Professor

John W. Root, Ph.D., Professor
Robert N. Rosenfeld, Ph.D., Assistant Professor

Carl W. Schmid, Ph.D., Associate Professor
Neil E. Schore, Ph.D., Assistant Professor

Kevin M. Smith, Ph.D., Professor
²Leo H. Sommer, Ph.D., Professor

James H. Swinehart, Ph.D., Professor
Dino S. Tinti, Ph.D., Associate Professor

Nancy S. True, Ph.D., Assistant Professor
⁴David H. Volman, Ph.D., Professor
⁴George S. Zweifel, Sc.D., Professor

The Major Programs

The goal of a bachelor's program in chemistry is to give a broad introduction to the principles of the field and to provide enough of the factual knowledge so that the student may quickly learn the specific chemistry applicable to the field in which the student chooses to work. 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 a professional school preparation or secondary school teaching. Students who plan to pursue graduate work in chemistry or related fields are strongly advised to obtain a reading knowledge of German or Russian. High school students should note that the preparation for either the A.B. or the B.S. degree is simplified if their high school programs include chemistry and four years of mathematics. Degree candidates in chemistry will receive upper division credit for those lower division chemistry courses accepted in lieu of upper division courses required for the major.

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. An advanced degree is usually required for a career in research or education.

Chemistry

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	36-43
Chemistry 1A-1B-1C-5 or 4A-4B-4C	15-19
Physics 2A, 2B, 2C, 3A, 3B, 3C	12
Mathematics 21A-21B-21C or 16A-16B-16C	9-12
Depth Subject Matter	36
Chemistry 110A, 110B, 110C, 128A, 128B, 128C, 129A, 129B	22
At least 14 additional upper division units in chemistry, biochemistry, or physics	14
Total Units for the Major	72-79

Chemistry

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	49-53
Chemistry 1A-1B-1C-5 or 4A-4B-4C	15-19
Physics 8A, 8B, 8C, 8D.	16
Mathematics 21A, 21B, 21C, 22B; 22A or 22C	18
Depth Subject Matter	45
Chemistry 110A, 110B, 110C, 111A, 111B, 124, 128A, 128B, 128C, 129A, 129B, 129C	36
At least 9 additional upper division units in chemistry (except Chemistry 107A, 107B), including one course with laboratory work	9
Total Units for the Major	98-102

Major Advisers. W. H. Fink, J. E. Keizer, R. E. Kepner, C. W. Schmid, D. S. Tinti.

Honors and Honors Program. The honors program comprises 6 units of course 194H.

Teaching Credential Subject Representative. C. P. Nash. See page 105 for the Teacher Education Program.

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.

Courses in Chemistry

Lower Division Courses

1A. General Chemistry (5) I, LaMar, McQuarrie, ———; II, S. Friedrich, Tinti

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: high school chemistry; or high school physics and three years of high school mathematics (with an average grade of B or higher); or second-quarter standing. Fundamental principles of chemistry. Stoichiometry, properties, and theory of gases, first law of thermodynamics, atomic and molecular structure, colligative properties of solutions.

1B. General Chemistry (5) I, Volman, Swinehart, ———; III, Allen, Keefer

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 1A or 4A. Continuation of course 1A. Chemical equilibria, oxidation-reduction processes, electrochemistry, introduction to qualitative analysis.

1C. General Chemistry (5) I, Case, Swinehart; III, McQuarrie, Rock

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 1B or 4B. Continuation of course 1B. Chemical kinetics, structures and reactions of complex ions and molecules, application of principles of chemistry to problems of qualitative analysis. Students who have had course 4B may receive only 4 units of credit for course 1C.

4A. General Chemistry (5) I, Tinti

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Mathematics 21A or 16A (may be taken concurrently); high school chemistry or consent of instructor. An introduction to atomic and molecular structure and binding, states of matter, thermochemistry and chemical equilibria. Courses 4A-4B-4C are equivalent to course sequence 1A-1B-1C-5. The sequence 4A-4B-4C is primarily for students majoring in the physical sciences.

4B. General Chemistry (5) II, True

Lecture—3 hours, laboratory—6 hours. Prerequisite: course 4A. Continuation of course 4A. A quantitative treatment of chemical equilibria with applications to precipitation reactions, acid-base reactions, complexation reactions, and oxidation-reduction reactions. Elementary electrochemistry and chemical kinetics. The laboratory will emphasize quantitative techniques.

4C. General Chemistry (5) III, Swinehart

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 4B. Continuation of course 4B. Topics in systematic inorganic chemistry, nuclear chemistry, introduction to organic chemistry and the functional group concept, biological applications. Laboratory will emphasize qualitative analysis and preparative techniques.

5. Quantitative Analysis (4) I, Nash; III, ———

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1C with a grade of C or higher. An introduction to the principles and methods of quantitative chemical analysis with emphasis on the application of equilibrium theory to analytical problems. Students who have received credit for the 4A-4B-1C sequence may enroll in course 5 for 2 units only; not open to students who have received credit for 4A-4B-4C.

8A. Organic Chemistry: Brief Course (3) I, Sommer; II, Doi, E. Friedrich; III, Musker

Lecture—3 hours. Prerequisite: course 1B with a grade of C or higher. With course 8B an introduction to the nomenclature, structure, chemistry, and reaction mechanisms of organic compounds. Intended for students majoring in areas other than chemistry.

8B. Organic Chemistry: Brief Course (3) I, Doi; II, Sommer; III, Bottini

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.

10. Concepts of Chemistry (4) I, Keizer

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 course 1A; but students with credit for course 10 may take course 1A for full credit.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Directed study of a special topic. (P/NP grading only.)

Upper Division Courses

107A. Physical Chemistry for the Life Sciences (3) I, Meares, Schmid

Lecture—3 hours. Prerequisite: course 4C or 5 or consent of instructor. Mathematics 16C or 21C; one year 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, Nash, Schmid

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, Hope, Volman; III, True

Lecture—3 hours. Prerequisite: course 5 or 4C; Mathematics 21C or 16C; one year of college physics. Development and application of the principles of chemical thermodynamics.

110B. Physical Chemistry: Quantum Mechanics (3) I, Fink; II, Maki

Lecture—3 hours. Prerequisite: course 110A. Atomic and molecular structure and spectra.

110C. Physical Chemistry: Kinetics (3) II, Root; III, Fink

Lecture—3 hours. Prerequisite: course 110B. Statistical thermodynamics, kinetic theory of gases, and chemical kinetics.

111A. Physical Chemistry: Methods and Applications (4) I, II, Brown

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107B or 110C (may be taken concurrently). Lecture topics include statistical analysis and data processing, basic electronics, diffraction methods, and optical systems. Laboratory exercises will involve computer practice, thermodynamic measurements on nonelectrolyte systems, and structural properties of molecules.

111B. Physical Chemistry: Methods and Applications (4) II, Hope; III, Brown

Lecture—1 hour; laboratory—9 hours. Prerequisite: course 111A or consent of instructor. Lecture topics will include distribution equilibria and electroanalytical methods. Laboratory exercises will involve kinetics and mechanism, electrochemistry, distribution, equilibria, chromatography, and elective projects.

121. Introduction to Molecular Structure and Spectra (4) III, LaMar

Lecture—4 hours. Prerequisite: course 110C. Modern theoretical and experimental methods used to study problems of molecular structure and binding; emphasis on spectroscopic techniques.

124. Inorganic Chemistry (4) II, Musker

Lecture—4 hours. Prerequisite: course 107B or 110B; 128B (any of which may be taken concurrently). Bonding, structure, and reactivity of inorganic compounds, including organometallic complexes and inorganic aspects of biological chemistry.

126. Nuclear Chemistry (4) I, Root

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 110B (may be taken concurrently with consent of instructor). Introduction to experimental and theoretical nuclear chemistry including nuclear properties, nuclear spectroscopy, radiation effects, radioactive decay, and nuclear reactions. Both the lectures and the laboratory stress applications of nuclear phenomena in chemistry.

128A. Organic Chemistry (3) I, Bottini; II, Miller; III, Rosenfeld

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. Only two units credit allowed students having had course 8B.

128B. Organic Chemistry (3) I, E. Friedrich; II, Smith; III, Schore

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, Kepner; II, Schore; III, Sommer
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, S. Friedrich; II, Bottini; III, S. Friedrich
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 1C or 4C with a grade of C or higher; 128A (may be taken concurrently). Introduction to laboratory techniques of organic chemistry. Emphasis is on methods used for separation and purification of organic compounds. Only one unit credit allowed students having had course 8B.

129B. Organic Chemistry Laboratory (2) I, Zweifel; II, Kepner; III, _____
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, Kepner; II, Schore; III, Doi
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. The application of physical and chemical techniques to the qualitative identification of organic compounds.

131. Modern Methods of Organic Synthesis (4) II. Zweifel
Lecture—4 hours. Prerequisite: course 128C, or consent of instructor. Introduction to modern synthetic methodology in organic chemistry with emphasis on stereo selective reactions and application to multistep syntheses of organic molecules containing multifunctionality.

140. Synthetic Methods (4) III.
Lecture—1 hour; laboratory—9 hours. Prerequisite: courses 124 and 131. An 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, Smith
Lecture—3 hours. Prerequisite: course 128C. Chemistry of terpenes, steroids, acetogenins, and alkaloids; isolation, structure determination, biosynthesis, chemical transformations, and total synthesis.

194H. Undergraduate Research (2-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: course 110C (may be taken concurrently) and honors status. Original research and a written report of the investigation. Unit value to be determined by instructor supervising the research. (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

210A. Advanced Physical Chemistry: Thermodynamics (4) I, Rock
Lecture—3 hours; either discussion—1 hour or paper at discretion of instructor. Prerequisite: consent of instructor. Principles and applications of statistical mechanics; ensemble theory; statistical thermodynamics of gases, solids, liquids, and solutions; surface effects; chemical equilibrium. Thermodynamics of gravitational, electric, and magnetic fields. The Third Law. Applications to biophysical problems.

210B. Advanced Physical Chemistry: Quantum Chemistry (4) II. Case
Lecture—3 hours; discussion—1 hour or paper at discretion of instructor. Prerequisite: consent of instructor. Principles of quantum chemistry and their applications to atomic and molecular structure and spectroscopy, and to chemical bonding.

210C. Advanced Physical Chemistry: Kinetics (4) III. Nash
Lecture—3 hours; discussion—1 hour or paper at discretion of instructor. Prerequisite: consent of instructor. Chemical kinetics in gases and liquids including the kinetic theory of gases, statistical theories of bimolecular and unimolecular reactions, introduction to trajectory methods, equilibrium structure of liquids, transport processes in fluids, photochemical processes, and relaxation kinetics.

219. Spectroscopy of Organic Compounds (4) III. E. Friedrich
Lecture—4 hours. Use of spectroscopy in organic chemistry for the identification of compounds and the investigation of stereochemical and reaction mechanism phenomena.

221A-H. Organic Chemistry (3) 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 124 or the equivalent. Electronic structures, bonding, and reactivity of transition metal compounds.

227A-F. Special Topics in Inorganic Chemistry (3) II, III. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Series of advanced, research-oriented special topics courses in inorganic chemistry.

230A-J. Special Topics in Physical Chemistry (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Series of advanced, research-oriented, special-topics courses in physical chemistry. Topics will vary each time the course is offered.

233. Physical Organic Chemistry (4) I, Rosenfeld
Lecture—4 hours. Modern concepts of substitution, elimination, and addition reactions, rearrangements, and stereochemistry.

290. Seminar (1) I, II, III. Balch, Schore, Tinti
Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

293. Introduction to Chemistry Research (1) I. The Staff (Graduate Advisers 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.)

296. 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.)

Chicano Studies

See Mexican-American
(Chicano) Studies

Child Development

See Human Development

Chinese

See Asian American Studies,
and Oriental Languages and
Civilizations

Classics

(College of Letters and Science)

Department Office (Spanish and Classics), 622
Sproul Hall (752-0835)

Faculty

Richard E. Grimm, Ph.D., Associate Professor
Lynn E. Roller, Ph.D., Assistant Professor
Wesley E. Thompson, Ph.D., Professor
David A. Traill, Ph.D., Associate Professor

The Major Programs

The Classics Department offers three major programs: *Latin*, *Greek*, and *Classical Civilization*. The major programs in Greek and Latin consist of the detailed study of the great works of Greek or Latin literature in the original language, including epic, lyric, drama, philosophy, history, and oratory. Both majors emphasize the study of language and literature. The major program in Classical Civilization offers an interdisciplinary approach to the ancient world. Students choosing this major supplement a core of courses in Greek or Latin (or both) with courses in ancient art, archaeology, history, philosophy, etc. All three majors provide the opportunity to study in depth a civilization that has profoundly influenced the western world.

The programs in Latin and Greek and, with careful planning, the program in Classical Civilization offer excellent preparation for graduate study in Classics, ancient history, comparative literature, and archaeology. In addition, the major in Greek provides suitable background for divinity school or for graduate work in philosophy.

The majors in Latin and Classical Civilization may lead to careers in teaching (Latin, history, general humanities) or museum work (Classical Civilization). All three majors can lead to careers in librarianship, journalism, and civil service. The professional schools, particularly law schools, have traditionally looked with favor on highly qualified students with training in Latin or Greek.

Classical Civilization

A. B. Major Requirements:

	UNITS
Preparatory Subject Matter	21-24
Greek 1, 2, 3 or Latin 1, 2, 3 or the equivalent	12-15
Three courses from the following, including at least one from Group (a)	9
(a) Classics 17A, 17B, 17C, 20, (b) Classics 4A, 10, 40, 41.	
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 139B, 141, 142	
(b) <i>History</i> : History 111A, 111B, 111C, 102A Religious Studies 102	
(c) <i>Art, Archaeology, and Drama</i> : Classics 174, 175 Art 154A, 154B, 154C, 155 Dramatic Art 156	
(d) <i>Philosophy and Political Theory</i> : Classics 150 Philosophy 143, 161, 162 Political Science 118A Rhetoric 110	

Total Units for the Major 61-64

Recommended

Art 1A; History 2; Philosophy 21; Comparative Literature 1;
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	0-12
Latin 1, 2, 3 (or the equivalent)	12
Depth Subject Matter	36
Latin 121	5
At least 31 additional upper division units in Latin	31
Total Units for the Major	36-48

Major Advisers. D. A. Traill (Classical Civilization); W. E. Thompson (Greek); and R. E. Grimm (Latin).

Minor Program Requirements:

	UNITS
Greek	21
Greek 3	5
Four upper division courses in Greek	16
Latin	20
Latin 3	4
Four upper division courses in Latin	16

Teaching Credential Subject Representative. R. E. Grimm. See page 105 for the Teacher Education Program.

Graduate Study. A program of study and research leading to the M.A. degree in Classics is offered. Detailed information regarding graduate study may be obtained from the Graduate Adviser.

Graduate Adviser. W. E. Thompson.

Courses in Classics

Lower Division Courses

4A. Classical Civilization (3) III. Roller
Lecture—3 hours. An introduction to the literature, art, and institutions of classical Greece.

10. Greek and Roman Mythology (3) I, Thompson
Lecture—3 hours. Origin and development of myths and legends, their place in the religion, literature, and art of Greece and Rome.

17A. Greek Archaeology (3) I, Roller
Lecture—3 hours. Greece, Crete, and the Aegean world during the Bronze Age with emphasis on the Minoan and Mycenaean civilizations. Consideration of certain aspects of Homeric civilization in light of the archaeological remains.

17B. Greek Archaeology (3) II, Roller
Lecture—3 hours. The archaeological monuments of Archaic and Classical Greece. Selections from Greek literature are related to the archaeological remains.

***17C. Roman Archaeology** (3) III, Roller
Lecture—3 hours. The development of Rome and its Empire as illustrated by the monuments.

20. Pompeii AD 79 (3) III, Traill
Lecture—3 hours. Roman life in an urban community at the time of the eruption of Vesuvius. Slide presentations of the

archaeological evidence will be supplemented by selected readings from Petronius' *Satyricon* and other ancient authors.

30. The Latin Element in Current English (3) II, Thompson, Grimm
Lecture—3 hours. Prerequisite: a knowledge of Latin is not required. The study of the derivation and usage of English words of Latin origin: analysis into their component elements directed toward understanding of form and meaning.

31. The Greek Element in Current English (3) III, Thompson, Traill
Lecture—3 hours. Prerequisite: knowledge of Greek not required. Study of the derivation and usage of English words of Greek origin: analysis into their component elements directed toward understanding of form and meaning.

40. Homer and the Tradition of Ancient Epic (3) II, Traill
Lecture—3 hours. Reading in translation of the *Iliad* and *Odyssey*. Homer's influence on Vergil. Lectures on the development of ancient epic. Offered in odd-numbered years.

41. Greek Tragedy (3) III, Grimm
Lecture—3 hours. Reading in translation of selected plays of Aeschylus, Sophocles, and Euripides. Lectures on the development and influence of Athenian tragedy.

Upper Division Courses

***139B. Greek Literature in Translation** (3) II, Thompson
Lecture—3 hours. Development of historical writing in Greece: Herodotus, Thucydides, and selections from the minor historians. Offered in even-numbered years.

***141. Greek and Roman Comedy** (4) II, Grimm
Lecture—3 hours; conference—1 hour. Readings in Aristophanes, Menander, Plautus, and Terence; lectures on the development of ancient comedy. Offered in odd-numbered years.

***142. Greek and Roman Novel** (4) I, Traill
Lecture—3 hours. 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*.

***150. Athenian Political and Social Institutions** (3) II, Thompson
Lecture—2 hours; discussion—1 hour. Politics and government, marriage and kinship, religious societies, and the demographic and economic basis of Athenian democracy. Offered in odd-numbered years.

***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 even-numbered 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 odd-numbered years.

197TC. Community Tutoring in Classical Languages (1-5) I, II, III, Grimm
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, Thompson
Seminar—3 hours. Survey of major contemporary areas of classical scholarship with special attention devoted to current problems in literary and textual criticism.

202. Homer (4) III, The Staff
Seminar—3 hours. Readings in the *Iliad* and *Odyssey*: the origins and transmission of the poems.

***203. Vergil** (4) II, Grimm
Seminar—3 hours. 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) I, Thompson
Seminar—3 hours. Historical and critical problems in Aristophanes or New Comedy. May be repeated for credit.

***205. Latin Lyric and Elegy** (4) II, Traill
Seminar—3 hours. Critical examination of the works of Catullus, Horace, or Propertius. May be repeated for credit.

***206. Greek Historiography** (4) III, Thompson
Seminar—3 hours. Development of historical writing in Greece. May be repeated for credit.

207. Greek Drama (4) II, Grimm
Seminar—3 hours. Literary and philological analysis of the plays of Euripides, Sophocles, or Aeschylus. May be repeated for credit.

Greek

Lower Division Courses

1. Elementary Greek (5) I, The Staff
Lecture—4 hours. 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—4 hours. Prerequisite: course 1. A continuation of course 1.

3. Elementary Greek (5) III, The Staff
Lecture—4 hours. Prerequisite: course 2. A continuation of course 2.

98. Directed Group Study (1-5) I, II, III, The Staff
Prerequisite: consent of instructor. Group study of selected topics. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

***100. Attic Orators** (4) II, Thompson
Lecture—3 hours. Prerequisite: course 3.

101. Plato (4) I, Thompson
Lecture—3 hours. Prerequisite: course 3.

***102. Euripides** (4) II, Grimm
Lecture—3 hours. 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) II, Thompson
Lecture—3 hours; term paper. Prerequisite: course 3.

***105. Demosthenes** (4) II, Thompson
Lecture—3 hours; term paper. Prerequisite: course 3.

***111. Sophocles** (4) III, Grimm
Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years.

112. Aristophanes (4) III, Grimm
Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years.

***113. Thucydides** (4) I, Thompson
Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years.

***114. Lyric Poetry** (4) III, Thompson
Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years.

***115. Aeschylus** (4) II, Grimm
Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years.

***116. Herodotus** (4) I, Thompson
Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years.

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 (Thompson in charge)
(P/NP grading only.)

Latin

Lower Division Courses

1. Elementary Latin (4) I, The Staff
Lecture—4 hours. 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.

1X. Intensive Latin (5) II, Traill
Lecture—5 hours. An intensive course designed primarily for graduate students and advanced undergraduates wishing to acquire rapidly a rudimentary knowledge of Latin. Covers the same material as Latin 1 and 2.

2. Elementary Latin (4) II. The Staff
Lecture—4 hours. Prerequisite: course 1. A continuation of course 1.

3. Elementary Latin (4) III. The Staff
Lecture—4 hours. Prerequisite: course 2. A continuation of course 2.

***10. The Structure of Latin (4) III.** Thompson
Lecture—4 hours. Prerequisite: not open to students who have received credit for any other course in Latin. Survey of the Latin language with special emphasis on the morphology and syntactical relationships of classical Latin.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Group study of selected topics. (P/NP grading only.)

Upper Division Courses

***100. Ovid (4) I, Traill**
Lecture—3 hours; paper. Prerequisite: course 3. Translation and discussion of selected readings from the works of Ovid.

***101. Livy (4) III.** Thompson
Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

102. Roman Comedy (5) I. Thompson
Lecture—4 hours; term paper. Prerequisite: course 3. Offered in even-numbered years.

103. Vergil: Aeneid (4) I.
Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years.

***104. Sallust (4) I.** Thompson
Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years.

***105. Catullus (4) I.** Grimm
Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

***106. Horace: Odes and Epodes (4) I.** Grimm
Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

***108. Horace: Satires and Epistles (4) II.** Grimm
Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

109. Roman Elegy (4) III. Grimm
Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

***111A-111B-111C. Silver Age Latin (4) I-II-III.** The Staff
Lecture—3 hours. Prerequisite: course 3. Selections from Tacitus, Pliny, Petronius, Juvenal, Martial, and other writers of the Silver Age. Offered in odd-numbered years.

***112. Cicero: Political Writings (4) I.** Thompson
Recitation—3 hours; term paper. Prerequisite: course 3.

***114. Cicero: Philosophical Works (4) II.**
Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

***115. Lucretius (4) II.** Traill
Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years.

***116. Vergil: Eclogues and Georgics. (4) III.**
Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years.

***121. Prose Composition (5) III.** Traill
Lecture—4 hours; term paper.

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 (Grimm in charge)
(P/NP grading only.)

Graduate Course

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Clinical Pathology

(School of Veterinary Medicine)

Jiro J. Kaneko, D.V.M., Ph.D., Chairperson of the Department

Department Office, 1319 Haring Hall (752-0153)

Faculty

Edward J. Carroll, Ph.D., Lecturer
Bernard F. Feldman, D.V.M., Ph.D., Assistant Professor

Nemi C. Jain, M.V.Sc., Ph.D., Professor
Donald E. Jasper, D.V.M., Ph.D., Professor
Jiro J. Kaneko, D.V.M., Ph.D., Professor
Oscar W. Schalm, D.V.M., Ph.D., Professor Emeritus

Joseph G. Zinkl, D.V.M., Ph.D., Assistant Professor

Courses in Clinical Pathology

Upper Division Courses

101. Comparative Hematology (2) II. Kaneko, Jain, Zinkl, Feldman
Lecture—2 hours. Prerequisite: Biological Sciences 1, 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) II. Kaneko, Zinkl, Jain, Feldman
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) I. Kaneko, ———
Lecture—2 hours; laboratory—2 hours. Prerequisite: Physiology 112, 113; Physiological Sciences 101A-101B or Biochemistry 101A-101B, or consent of instructor. Principles and methods of clinical biochemistry; determination and interpretation of the biochemical constituents of the blood, urine and other body fluids.

199. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

204. Normal and Abnormal Bone Marrow Cytology (1) I. Feldman, Zinkl
Lecture-laboratory—2 hours. Prerequisite: Veterinary Medicine 135 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) II. 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 even-numbered years.

206. Immunohematology (2) II. Jain, Carroll, J. Lewis (Medicine), 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 odd-numbered years.

261. The Bovine Mammary Glands in Health and Disease (1) II. Jasper, Carroll
Lecture—1 hour. Prerequisite: consent of instructor. Relationship of mastitis and milk quality; infectious causes and the influence of environment, milking machines and management on mastitis; pathogenesis of mastitis; cellular and humoral defense mechanisms; mastitis diagnosis and control.

290. Seminar in Clinical Pathology (1) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research in Clinical Pathology (1-12) I, II, III. The Staff (S/U grading only.)

Clinical Psychology

See Medicine

Community Health

See Medicine

Community Nutrition

(College of Agricultural and Environmental Sciences)

The Major Program

Community Nutrition focuses on the biological, economic, environmental, and socio-cultural factors which influence dietary practices and the nutritional status of individuals and groups. The aim of Community Nutrition is the application of this knowledge in the development and implementation of programs to improve the availability and use of food in the community. The major is designed for students who seek to combine a foundation in the biological and nutritional sciences with concentrated study in a social science discipline. 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 the socio-cultural, psychological, or economic aspects of food, diet, and nutrition.

Graduates are prepared for entry-level positions in health and social service agencies in the United States and abroad. Job possibilities include nutrition specialists in community programs for ethnic minorities in the United States or nutrition research and education programs abroad (Socio-Cultural option); nutrition counselors in behavioral modification programs for weight control, cardiovascular disease, child development, and community mental health programs (Psychological option); staff analysts or administrative assistants or nutrition specialists in agriculture, health and welfare agencies having food assistance or nutrition education components (Economics option).

Advancement to positions of professional responsibility in each field will require additional training and experience. The major is unique in that it provides opportunities for graduate study in either Nutrition or the selected Social Science discipline.

Community Nutrition

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
Preparatory Subject Matter	50-53
Bacteriology with laboratory (Bacteriology 2, 3)	4
Biology (Biological Sciences 1)	5
Chemistry, general and organic (Chemistry 1A, 1B, 8A, 8B)	16
Computer logic or programming (Consumer Technology 31 or Mathematics 19)	1-3
Cultural social science (Anthropology 2, Geography 2 or Sociology 3)	4
Cultural food habits (Nutrition 20)	4
Oral and written expression (see College requirements, page 70)	8
Social research methods (Sociology 46A or Psychology 41)	4
Social statistics (Economics 12, Sociology 46B, or Statistics 13)	4-5
Depth Subject Matter	50-51
Biochemistry 101A-101B or Physiological Sciences 101-101B	6-7
Food Science and Technology 100A, 100B, 101A, 101B	10
Nutrition 110, 111, 111L, 116A, 116B, 118, 119, 120	27
Physiology 110, 110L	7
Option Subject Matter	48-50

Socio-Cultural Option

Anthropology 101, 126	8
Anthropology 141 or Geography 170	4
Foreign language (French 1 and 2; German 1 and 2; or Spanish 1 and 2)	12
Geography 175	4
Restricted electives (selected with consultation of adviser)	20

Behavioral-Psychological Option

Education 110 or Psychology 130	4
Human Development 100A, 100B, 100C	12
Psychology 1, 108, 145	13
Restricted electives (selected with consultation of adviser)	20

Economics Option

Agricultural Economics 100A, 100B	6
Consumer Economics 141, 142	8
Economics 1A, 1B	10
Mathematics 16A, 16B	6
Restricted electives (selected with consultation of adviser)	20

Unrestricted Electives

Total Units for Degree **180**

Major Adviser. L.E. Grivetti (*Nutrition*).

Graduate Study. See page 99 and the *Announcement of the Graduate Division*.

Comparative Literature

(College of Letters and Science)

Manfred Kusch, Ph.D., Program Director
Program Office, 912 Sproul Hall (752-1219)

Committee in Charge

⁴Manfred Kusch, Ph.D., (*French*), Committee
Chairperson, Fall-Winter Quarters

NOTE: For key to footnote symbols, see page 130.

- Roland W. Hoermann, Ph.D. (*Comparative Literature, German*), Committee Chairperson, Spring Quarter
 Ruby Cohn, Ph.D. (*Comparative Literature, Dramatic Art*)
 Alfonso De Petris, Dottore in Lettere (*Italian*)
 Winfried Schleiner, Ph.D. (*English*)
³Robert M. Torrance, Ph.D. (*Comparative Literature, Fall Quarter*)
 Hugo J. Verani, Ph.D. (*Spanish*)

Faculty

- Richard N. Coe, Ph.D., Professor (*French*)
 Ruby Cohn, Ph.D., Professor (*Comparative Literature; Dramatic Art*)
 Roland W. Hoermann, Ph.D., Associate Professor (*Comparative Literature, German*)
⁴Manfred Kusch, Ph.D., Associate Professor (*French*)
²Peter M. Schaeffer, Ph.D., Associate Professor (*German*)
³Robert M. Torrance, Ph.D., Associate Professor
 Marian B. Ury, Ph.D., Associate Professor (*Comparative Literature, Religious Studies*)
 Karl F. Zender, Ph.D., Assistant Professor

The Major Program

Few people would think of studying only English physics, German biology, French painting, or Spanish music. Yet most literature majors study books originally written in a single language. Comparative Literature, on the other hand, encourages students to read, and to think about, and to compare books from different countries and from different parts of the world — from Italy and Russia as well as England and the United States, and from Asia and Latin America as well as North America and Europe.

Comparative Literature thus enlarges students' horizons by bridging the divisions between national cultures instead of concentrating on a single tradition. Both the major and minor programs allow students to combine courses in one or more national literature departments together with courses in Comparative Literature. Students who enjoy reading books, exploring ideas, and learning about different civilizations will find Comparative Literature a stimulating field of study.

The introductory course sequence, "Great Books of Western Civilization," 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. No foreign language is required for the minor.

Students majoring in Comparative Literature choose a first and a second literature of concentration, one of which may be English. After the introductory sequence, each student's major course work is divided between courses in the two literatures of concentration and Comparative Literature courses. These Comparative Literature courses encourage students to take a broad view of a historical period, a theme, a genre, or a literary movement. The wide variety of options in the program permits great flexibility and encourages interdisciplinary connections between literature and philosophy, psychology, history, and the arts. Each student's plan of study must be approved by an adviser at the beginning and end of each academic year.

Career Alternatives. Careers directly related to Comparative Literature include teaching, journalism, publishing, and translating. Most Comparative Literature majors, however, are preparing for other careers that will employ the skills they have learned in the process of acquiring a stimulating and enriching education. The major in Comparative Literature gains useful experience in one or more foreign

languages, in careful analytical thinking, and in precise use of the English language. Because many professional schools consider a literature major an excellent background for their graduate disciplines, Comparative Literature provides valuable preparation (along with supplementary courses outside the major) for careers in business, government, medicine, or law.

Comparative Literature

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	12-42
Comparative Literature 1, 2, 3	12
Foreign language: sufficient preparation to insure satisfactory performance in the upper division level	0-30
Depth Subject Matter	40
Seven upper division courses (in original languages, one of which may be English) distributed between the first and second literatures of concentration with the approval of the adviser	28
Comparative Literature 141	4
Two additional upper division Comparative Literature courses, preferably including one in a major literary period or movement	8
Total Units for the Major	52-82

Recommended

Art 10; Dramatic Art 20; Classics 10, 40, 41; History 4A, 4B, 4C; Philosophy 6.

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 language requirement for the minor.

	UNITS
Comparative Literature	24
Comparative Literature 1, 2, or 3	4
Two upper division Comparative Literature courses (Comparative Literature 141 strongly recommended)	8
Three upper division courses in one or two national literatures (including English)	12
Courses should form a coherent program, with emphasis on a historical period, genre, or literary movement, and should be chosen in consultation and with the approval of the adviser.	

Major Adviser. R.M. Torrance.

Consultation with Adviser

All Comparative Literature majors and minors must see their adviser, individually, at least once at the beginning and once at the end of each academic year.

Teaching Credential Subject Representative. R.W. Hoermann. See page 105 for the Teacher Education Program.

Graduate Study. Comparative Literature offers programs of study and research leading to the M.A. and Ph.D. degrees. Detailed information may be obtained from the Graduate Adviser.

Graduate Adviser. R. Cohn.

Courses in Comparative Literature

Lower Division Courses

1. Great Books of Western Civilization: From Myth to Faith (4) I, II, III. Director in Charge
 Lecture—2 hours; discussion—2 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*.

2. Great Books of Western Civilization: From Faith to Reason (4) I, II, III. Director in charge
Lecture—2 hours; discussion—2 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*.

3. Great Books of Western Civilization: The Modern Crisis (4) I, II, III. Director in charge
Lecture—2 hours; discussion—2 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*.

***4. The Short Story and Novella** (4) II. The Staff (Director in charge)
Lecture—1 hour; discussion—2 hours; term paper. An introduction to shorter forms of prose fiction by major authors of different countries, with especial emphasis on the modern period.

5. Fairy Tales, Fables, and Parables (3) II. Ury
Lecture—2 hours; discussion—1 hour. An introduction to fairy tales, fables, and parables as recurrent forms and motifs in literature, with readings from such diverse writers as Aesop and Grimm, Chaucer and Shakespeare, Kafka and Borges.

6. Myths and Legends (3) III. Ury
Lecture—2 hours; discussion—1 hour. An introduction to the comparative study of myths and legends, excluding those of Greece and Rome, with readings from Near Eastern, Teutonic, Celtic, Indian, and Japanese literary sources.

7. Literature of Fantasy and the Supernatural (3) II. Hoermann
Lecture—2 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.

8. Utopias and Their Transformations (3) III. Hoermann
Lecture—2 hours; discussion—1 hour. 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.

10A-N. Masterpieces of World Literature (2) I, II, III. The Staff (Director in charge)

Lecture-discussion — one 2-hour session. A representative series of courses designed primarily to acquaint the non-literature major with a cross-section of the world's most important literature; readings in English translation. Content will alternate 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/Calderon, Moliere/Racine, Lessing/Schiller; (H) Goethe, Byron, Stendhal, Pushkin, Lermontov; (I) Hoffmann, Gogol, Poe, Hawthorne, Maupassant, Chekhov, Melville; (J) Flaubert, Twain, Turgenev, Galdos, Ibsen; (K) Balzac, Dostoevski/Tolstoi, Hardy, Shaw, Strindberg; (L) Unamuno, Svevo, Conrad, Gide, Kafka, Faulkner; (M) Rilke/Yeats, Joyce/Woolf, Mann/Celine, Bulgakov/Tanzaki, O'Neill/Brecht, Lorca/Pirandello; (N) Camus/Sartre, Garcia Marquez/Grass, Borges/Sarraute, Bellow/Nabokov, Beckett/Pinter, Genet/Durrenmatt. May be repeated for credit in different subject area. Limited enrollment. (P/NP grading only.)

13. Dramatic Literature (4) III. Cohn
Lecture—2 hours; discussion—1 hour; term paper. An introduction, through careful reading of selected plays, to some of the major forms of drama from the earliest tragedies of ancient Greece to the contemporary theater of the Absurd.

***15. The Spiritual Quest** (3) I. Torrance
Lecture—2 hours; discussion—1 hour. 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*.

***20. Man and the Natural World** (4) III. Torrance
Lecture—2 hours; discussion—1 hour; term paper. An 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.

***40. Introduction to Comparative Literature** (4) I. Torrance
Lecture—2 hours; discussion—1 hour; term paper. An introduction to reading of different kinds of works, including poems, plays, short fiction, and a novel drawn from several literatures.

***49. Freshman Seminar: General Topics in Comparative Literature** (2) I. The Staff (Director in charge)
Seminar—2 hours. Introductory comparative studies dealing with such topics as Utopia, childhood and adolescence, sense and nonsense, and the voyage as recurrent themes in literature. (P/NP grading only.)

53A-C. Literature of the Eastern World (3) I, II, III. Ury
Lecture—1 hour; discussion—2 hours. A discussion course in English translation for non-literature majors, dealing with the most important and representative works of the epic, drama and poetry generated by such cultures as the Buddhist, Hindu, Islamic and Zoroastrian. Readings will include for (A), China and Japan: Chuang Tzu, *Water Margin*, *Pillow Book of Sei Shonagon*, *Essays in Idleness*, the *I Ching*, and kabuki drama; for (B), India and Southeast Asia: the *Vedas*, the *Mahabharata*, the *Ramayana*, and the *Panchatantra*; for (C), The Near East: Ibn Khaldun, *Thousand and One Nights*, the *Shahnamah*, Turkish folk tales, and Sufi mystic poetry.

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

***100. Majors Colloquium** (2) III. The Staff (Director in charge)
Seminar—1 hour; term project. Weekly presentations and discussions of topics appropriate to the comparative study of literature. May be repeated once for credit. (P/NP grading only.)

135. Women Writers (4) III. Ury
Lecture—1 hour; discussion—2 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.

***140. Thematic and Structural Study of Literature** (4) II. The Staff (Director in charge)
Lecture—2 hours; discussion—1 hour; term paper. Interpretation of selected works illustrating the historical evolution of themes, as well as of formal and structural elements.

141. Literary Theory and Criticism (4) I. Torrance
Lecture—2 hours; discussion—1 hour; term paper. Exploration of literary theories with emphasis on specific objectives and possibilities of comparative literature.

***142. Critical Reading and Analysis** (4) I. The Staff (Director in charge)
Lecture—2 hours; discussion—1 hour; 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.

***159A-G. Special Topics in Comparative Literature** (4) I, II, III. The Staff (Director in charge)

Lecture—2 hours; discussion—1 hour; term paper. Intensive study of selected subjects: (A) The Play Within the Play; (B) The Lyrical Novel; (C) Women in Literature; (D) The Role of Philosophy in Literature; (E) The Role of Psychology in Literature; (F) The Religious Experience in Literature; (G) Literary Attitudes and Judgment. May be repeated for credit in different subject area.

160A. The Modern Novel (4) I. Torrance
Lecture—2 hours; discussion—1 hour; term paper. The changing image of man and his world as seen in novels by such writers as Joyce, Proust, and Mann.

160B. The Modern Drama (4) III. Cohn
Lecture—2 hours; discussion—1 hour; term paper. Readings in representative authors such as Ibsen, Strindberg, Chekhov, Pirandello and Brecht.

***161A. Tragedy** (4) I. Cohn
Lecture—2 hours; discussion—1 hour; term paper. Persistent and changing aspects of the tragic vision in literature from ancient times to the present.

***161B. Comedy** (4) II. Cohn
Lecture—2 hours; discussion—1 hour; term paper. Comic attitudes towards life in literary works of different ages.

***161C. Tragicomedy** (4) III. Cohn
Lecture—2 hours; discussion—1 hour; term paper. A survey of works in the mixed mode from ancient times to the present.

***162. The Theory and Practice of Literary Translation** (4) II. The Staff (Director in charge)
Lecture—2 hours; discussion—1 hour; term translation project. Prerequisite: competence in "source" language and consent of instructor. Theories and problems of rendering texts in foreign languages into English.

163. Biography and Autobiography (4) III. Coe
Lecture—2 hours; discussion—1 hour; term paper. Portrayals of a human life in biographies and/or autobiographies of different countries and ages. Offered in odd-numbered years.

***164A. The Middle Ages** (4) I. Torrance
Lecture—2 hours; discussion—1 hour; 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.

***164B. The Renaissance** (4) II. Torrance
Lecture—2 hours; discussion—1 hour; 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.

***164C. Baroque and Neoclassicism** (4) III. Torrance
Lecture—2 hours; discussion—1 hour; term paper. Readings in major authors such as Calderon, Corneille, Pascal, Racine, Milton, and Grimmelshausen, with consideration of the tension between the expansive energies of the "baroque" and the restraints of dogma and reason.

***164D. The Enlightenment** (4) I. Kusch
Lecture—2 hours; discussion—1 hour; term paper. Readings in major authors such as Swift, Voltaire, Rousseau, Sterne, and Kant, with emphasis on philosophical ideas and literary forms.

***166A. The Epic** (4) I. The Staff (Director in charge)
Lecture—2 hours; discussion—1 hour; 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.

166B. The Novel (4) II. Kusch
Lecture—2 hours; discussion—1 hour; 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.

***167. Comparative Study of Major Authors** (4) II. Torrance
Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Pivotal works of artists in the Western mainstream, such as Dante, Shakespeare, Cervantes, Goethe, Tolstoi, Proust, and Joyce.

168A-C. Modern Literary Movements and Styles (4) I. The Staff (Director in charge)
Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in major literary movements of the modern period: (A) Romanticism; (B) Symbolism; (C) Realism and Naturalism. May be repeated for credit in different subject area.

***169. The Avant-Garde** (4) II. Kusch
Lecture—2 hours; discussion—1 hour; term paper. Studies in movements such as surrealism, expressionism and the absurd.

197T. Tutoring in Comparative Literature (2-4) I, II, III. Hoermann
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 (e.g., Freshman Seminar, course 49). 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) I, Cohn
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.

250A. Research in Comparative Literature (4) I, II, III. The Staff (Director in charge)
Individual instruction—1 hour. Prerequisite: course 200. In-

dividually 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: course 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: course 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.

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.)

Computing Science

See Engineering: Electrical and Computer Science, or Mathematics

Consumer Economics

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Agricultural Economics.

Major Program and Graduate Study

See the major in Development, Resource, and Consumer Economics (page 169); and see pages 99 and 135.

Related Courses. See Agricultural Economics.

Courses in Consumer Economics

Questions pertaining to the following courses should be directed to the instructor or to the Department of Agricultural Economics, 105 Voorhies Hall.

Upper Division Courses

141. Consumers and the Market (4) II, Lane; III, Kushman
Lecture—4 hours. Prerequisite: Economics 1A. Factors affecting consumer expenditures. The 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 Agricultural Economics 100A, Economics 100, or the equivalent may receive only 3 units of credit, so must enroll in course 141M.

141M. Consumers and the Market (3) II, Lane; III, Kushman
Lecture—4 hours. Prerequisite: Economics 1A. Factors affecting consumer expenditures. The structure of the mar-

ket 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 Agricultural Economics 100A, Economics 100, or the equivalent must enroll in this course (for 3 units) rather than course 141.

142. Personal Finance (4) I, III. Zoloth
Lecture—4 hours. Prerequisite: Economics 1B. The management of income and expenditures by the household. The use of consumer credit, savings, investments, an insurance by households. Principles of tax, retirement, and estate planning.

196. Directed Group Study (1-5) I, II, III. Th 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

***220. Economics of Consumer Policy** (3) III. Shepard
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.

***258. Economics of Consumption** (3) III.
Lecture—3 hours. Prerequisite: one graduate course in micro-economic theory. Advanced analysis of individual and aggregate consumption models; empirical determinants of consumer behavior; application of consumption economics to selected issues.

290. Seminar (1) I, II, III. Lane
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 Food Science

(College of Agricultural and Environmental Sciences)

The Major Program

The Consumer Food Science major emphasizes both the biological properties of foods and the socioeconomic and cultural aspects of foods as they relate to consumer acceptability and use. Students are provided with sufficient range in study of the biological, natural, and social sciences to prepare them for careers such as food product development, quality assurance, marketing and sensory analysis, extension service, creative writing, and community service. The major provides academic preparation for those who plan to pursue similar careers or to undertake graduate study in Food Science or Nutrition.

Consumer Food Science

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
Preparatory Subject Matter	60
Biochemistry (Biochemistry 101A-101B)	6
Biology with laboratory (Biological Sciences 1)	5
Chemistry, general and organic (Chemistry 1A-1B-1C, 8A-8B)	21
Mathematics and physics (Mathematics 19, Physics 10)	7

Microbiology with laboratory (Bacteriology 2, 3)	4
Physiology (Physiology 110)	5
Statistics (Agricultural Science and Management 150)	4
Written and oral expression (see College requirement)	8

Depth Subject Matter

Community nutrition (Nutrition 118)	3
Consumer economics (Consumer Economics 141, 142)	8
Food Science and Technology including 100A, 100B, 101A, 101B, 107, Nutrition 20 or 120, and one additional course each in food chemistry, food microbiology, and food processing	26
Human nutrition with laboratory (Nutrition 110, 111, 111L)	10

Breadth Subject Matter

Principles of economics (Economics 1A-1B)	10
Consumer behavior (Consumer Science 100)	3
At least one course from two different areas: agricultural economics, applied behavioral sciences, consumer sciences, cultural anthropology, psychology, or sociology. Remainder in social sciences and humanities electives	11

Restricted Electives

Food related courses selected in accordance with student's educational goal with approval of adviser	20
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Unrestricted Electives

Total Units for the Major **180**

Recommended

It is recommended that students interested in graduate work take Chemistry 5, English 104, Mathematics 16A-16B-16C and Physics 2A-2B-2C.

Major Adviser. H. G. Schutz (*Textiles and Clothing*).

Graduate Study. Related graduate study and research leading to the M.S. degrees in Food Science or Nutrition is available. See page 99 and the *Announcement of the Graduate Division* for details on graduate study.

Consumer Science

(College of Agricultural and Environmental Sciences)

Faculty

See under the Division of Textiles and Clothing, and the Departments of Agricultural Economics and Food Science and Technology.

Major Programs and Graduate Study

Consumer Food Science (this page) and Home Economics (page 229) are related majors; for graduate study, see page 99.

Related Courses. See Consumer Economics, Food Science and Technology, Nutrition, and Textiles and Clothing.

Courses in Consumer Science

Questions pertaining to the following courses should be directed to the instructor or to the Division of Textiles and Clothing, 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

NOTE: For key to footnote symbols, see page 130

Consumer Technology; Design

for human consumption. Course given between Winter and Spring Quarters and considered a Spring course for pre-enrollment. Advance enrollment with instructor required. (P/NP grading only.)

92. Internship in Consumer Science (1-12) I, II, III. The Staff (S.H. Zeronian in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience on and off campus in a consumer science related area. (P/NP grading only.)

Upper Division Courses

100. Consumer Behavior (3) I, Schutz
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.

135. Principles of Food Product Development (3) I, Schutz
Lecture—3 hours. Prerequisite: one course in introductory food science. Presents basic concepts of product research and development. Organization, activities, new product development, project management. Role of food regulations, consumerism, marketing, advertising, consumer research.

140. Management for the Consumer (4) III.
Lecture—4 hours. Prerequisite: Psychology 1; Consumer Economics 142, senior or graduate status recommended. Application of the theories of management and decision making for the consumer. Emphasis on the effect of consumer decisions on the home, community, and society.

145. Concepts and Problems in Management for the Consumer (3) III.
Lecture—1 hour; laboratory—6 hours. Prerequisite: senior or graduate status, course 140 (may be taken concurrently). An in-depth study of a management problem encountered by the consumer with emphasis on management issues related to the home, community or society. Emphasis is on the application of theory to problem definition and solution. Students will complete an independent project in management.

192. Internship in Consumer Science (1-12) I, II, III. The Staff (S.H. Zeronian in charge)
Laboratory—3-36 hours. Prerequisite: completion of a minimum of 84 units; consent of instructor. Work-learn experience on and off campus in a consumer science related area. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Zeronian in charge)
Group study or experimentation on consumer related topics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Zeronian in charge)
Individual student reading, library research or experimentation. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Zeronian in charge)
Individual student reading, library research or experimentation. (P/NP grading only.)

Graduate Courses

200. Consumer Research Methods (3) II, Schutz
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Topics will include consumer laboratory and field attitude research, consumer sampling, measurement techniques, scales and methods of analysis.

***290. Seminar in Consumer Science** (1) I, II, III. The Staff (Zeronian in charge)
Seminar—1 hour. Prerequisite: graduate standing. Selected topics related to the consumer, consumer problems, and consumer-oriented research will be presented. A broad spectrum of consumer topics will be presented over the three-quarter sequence. May be repeated 3 times for credit.

298. Group Study (1-5) I, II, III. The Staff (Zeronian in charge)
Prerequisite: graduate standing.

299. Research (1-12) I, II, III. The Staff (Zeronian in charge)
Prerequisite: graduate standing. (SU grading only.)

Consumer Technology

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Agricultural Engineering.

Courses in Consumer Technology

Questions pertaining to the following courses should be directed to the instructor or the Department of Agricultural Engineering, 2030 Bainer Hall.

Lower Division Courses

15. Experiments in Creative Woodworking (1) II, III. O'Brien
Laboratory—2 hours. Experimental comparison of techniques for creating objects and structures of wood. Physical principles and properties of woods as related to structural stability, selection and use of tools, and aesthetics in design; finishes to preserve, enhance, or create effects.

16. Experiments in Creative Metalworking (1) III. Garrett
Laboratory—2 hours; demonstration—1 hour. Prerequisite: Chemistry 1A and Physics 2A recommended. Experimental comparisons of techniques for creating objects and structures of metal. Physical principles, design considerations, effects of techniques on quality and appearance; bases for self-evaluation of skills. Layout, cutting, forming, welding and finishing. (P/NP grading only.)

17. Electrical Appliances and Systems (2) III. Miles
Lecture—1 hour; laboratory—3 hours. Characteristics and principles of electrical appliances and systems for lighting, heating, and power. Principles of electricity; loads, distribution, and control; safety; planning systems and selecting appliances.

22. Characteristics of Land Vehicles (1) I, Goss
Lecture—1 hour. Comparative study of the stability, control, performance and safety of various vehicles including automobiles, bicycles and motorcycles.

31. Using Calculators and Computers for Records and Problems (1) I, II, III. Brune, Rumsey
Discussion-laboratory—2 hours. Directed exercises in using computers and computing calculators for solving selected agricultural, management, and production problems. Batch and time-sharing computing methods; programmable desk calculators. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Garrett 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 (Garrett in charge)
(P/NP grading only.)

Upper Division Courses

101. Engines for Automotive, Agricultural, Residential, and Recreational Use (3) II. Kaminaka
Lecture—2 hours; laboratory—2 hours. Prerequisite: upper division standing or consent of instructor. Principles of engine construction, operation, performance, and utilization. Properties of fuels, lubricants, and engine exhaust. Principles of combustion, carburetion, and electrical systems.

111. Home Design (1) III. O'Brien
Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Study of factors to be considered in planning new or remodeled homes. Factors include size, layout, location, orientation, materials, traffic patterns, facilities, aesthetics, cost, and building codes and regulations.

113. Sanitation and Water Supply for Remote Locations (1) III. Hills
Lecture—1 hour. Prerequisite: upper division standing; Physics 2B and Chemistry 1B recommended. Sources of domestic water at remote locations; sanitary precautions; methods and equipment for sanitary disposal of domestic wastes.

113L. Laboratory Studies in Sanitation and Water Supply for Remote Locations (1) III. Hills
Laboratory—3 hours. Prerequisite: course 113 (concurrently). Directed laboratory exercises, field trips, and special projects to augment the study of course 113. (P/NP grading only.)

196. Individual Projects (1-2) I, II, III. Garrett, O'Brien
Prerequisite: consent of instructor. Directed exercises in planning and executing independent projects consistent with the student's abilities. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Garrett in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Garrett in charge)
(P/NP grading only.)

Design

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Applied Behavioral Sciences.

The Major Program

The Design program challenges students whose professions will involve them in constructing the future shape of our everyday lives. Through visual and aesthetics communication you will build a real time-space environment. The primary factor in a designer's relationship to the community or environment is a knowledgeable, sound background in design. Without such expertise, the relationship is meaningless. The designer must have the skill to be imaginative, yet practical.

At the present time, the curriculum in Design offers emphasis in costume, textiles and environments with supporting graphics courses. This is not a static program, but changing in content and size to reflect the needs of the students and faculty. Through individual planning, the program offers flexibility to allow for (1) concentration on specialty, (2) preparation for graduate design programs in universities and professional schools, (3) general education in design stimulating the creativity of the individual, and (4) techniques for self-education throughout an entire life span.

Through the Design program you will be encouraged to transmit your knowledge of skill to one person or many whenever the need arises in the community.

Design

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	12
Visual communication through design, Design	
6A or 6B or 6C	4
Drawing, Design 20A	4
Media, Design 20B	4
Depth Subject Matter	48
Individualized program of 48 units in Design courses to include at least 36 upper division units, determined by the student and faculty adviser.	
Breadth Subject Matter	81
Natural sciences	27
Humanities†	27
Social sciences†	27
Unrestricted Electives	39
Total Units for the Major	180

Additional Requirement

Development of a course of study, in consultation with an adviser, to be reviewed by a committee of Design faculty no later than the second quarter of the junior year.

Depth Subject Matter

Examples of programs in each area of emphasis may be obtained from the Department of Applied Behavioral Sciences.

Major Adviser. F. Butler (*Applied Behavioral Sciences*).

Related Courses. See Environmental Planning and Management 20, 22, 136.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Courses in Design

Questions pertaining to the following courses should be directed to the instructor or to the Department of Applied Behavioral Sciences, 119 AOB-4.

Lower Division Courses

6A-6B-6C. Visual Communication Through Design (4-4-4)
A:I, Berteaux; B:II, Laky; C:III, Gotelli
Lecture—3 hours; discussion—1 hour. Consideration of the social, cultural and physical needs of man influencing design: (A) Environmental; (B) Personal Expression; (C) Communication Design. May be taken in any order. (P/NP grading only.)

20A. Drawing (4) I, II, III. The Staff (Gotelli in charge)
Studio—8 hours. Drawing for the designer as an aid to perception and communication of ideas, objects, and plans. May be repeated with a different instructor for a total of 8 units.

20B. Media (4) I, II, III. The Staff (Gotelli in charge)
Studio—8 hours. Introduction to the tools, materials, and techniques used in the designer's studio. May be repeated with a different instructor for a total of 8 units.

20C. Photographic Media (4) I, II, III. The Staff (Butler in charge)
Studio—8 hours.

21. Drafting and Perspective (4) I, II, III. The Staff (Olsen in charge)
Studio—8 hours. Prerequisite: course in drawing recommended. Creation of three-dimensional designs on two-dimensional surfaces.

22. Lettering and Type Design (4) I, II, III. The Staff (Butler in charge)
Studio—8 hours. Understanding of the forms and spacing of the Latin alphabet: hand-lettering, constructed letters, basic type styles, type measures, and layout.

23. Personal Adornment (4) III. Stabb
Studio—8 hours. Exploration of man's image altered through ornament and its relation to the human structure.

24. Non-Loom Textiles (4) II. The Staff (Laky in charge)
Studio—8 hours. Contemporary approach to non-loom textile techniques; netting, plaiting, knotting, and basketry. May be repeated once for credit with different instructor.

25. Reproduction Graphics (4) I, II, III. The Staff (Butler in charge)
Studio—8 hours. Basic studio and photographic skills for the designer; continuous tone, line and halftone films, mechanical and four-color screen separations.

26. Visual Presentation (4) III. Gotelli
Studio—8 hours. Exploration of communication through display and exhibition design.

92. Internship (1-12) I, II, III. The Staff (Pilisuk in charge)
Field placement—3-36 hours. Prerequisite: lower division standing and consent of instructor. Supervised internship, off and on campus, in areas of Design, including environmental, costume, textile, graphic, museum, display, and interior design. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Pilisuk in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

130. Model Construction (4) II, Gotelli; III, Berteaux
Studio—8 hours. Prerequisite: preparation in drafting and perspective recommended. Construction and presentation of working models from drawings of furniture, interiors, exteriors, and playground equipment.

131. Layered Textiles (4) II. The Staff (Laky in charge.)
Studio—8 hours. Prerequisite: background in drawing, personal adornment and non-loom textiles recommended. Exploration of multi-pieced and multi-layered textiles: applique, patchwork, quilting, stump work. The individualized influences of materials and techniques on contemporary textiles.

132. Loomed Textiles (4) I, III. The Staff (Laky in charge)
Studio—8 hours. Prerequisite: course 24 recommended. Influences of material and techniques of the woven form of tapestry weaving and frame loom weaving, natural dying and simple loom construction. May be repeated once for credit with different instructor.

133A-133B-133C. Communication Graphic Design (4-4-4)
I-II-III. Butler
Studio—8 hours. Prerequisite: courses 20A, 20B, 20C, 22, 25. Study and practice of graphic communication, to include poster, brochure, book, and three dimensional design.

134. Environmental Design (4) I, Gotelli; II, _____
Studio—8 hours. Prerequisite: courses 21, 130 recommended. Exploration of specific problems in interior form and exterior space such as: design for the disabled; and contemporary urban problems.

135. Furniture Design (4) III. Olsen
Studio—8 hours. 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.

140A. History of Design (3) I. The Staff
Lecture—3 hours. Prerequisite: Art 1A (may be taken concurrently). The history of Western design from Ancient Egypt and the Middle East through the Aegean and Classical civilizations to the waning of the Middle Ages.

140B. History of Design (3) II. The Staff
Lecture—3 hours. Prerequisite: Art 1B or consent of instructor. The history of Western design from the Renaissance through the Baroque, the Rococo and Neoclassicism of the eighteenth century, nineteenth century, industrialization to the emergence of modernism.

142A. World Textiles: Far East and Pacific (4) I. The Staff
Lecture—3 hours, discussion—1 hour. Prerequisite: Art 1A. Exploration through lectures and visual material of the textile arts of Japan, China, Korea, India, Indonesia, and the Pacific Islands with emphasis on the aesthetic and stylistic qualities of these cultures.

142B. World Textiles: Middle East, Europe and United States (4) III. The Staff
Lecture—3 hours, discussion—1 hour. Prerequisite: Art 1A. Exploration through lectures and visual material of the textile arts of the Middle East, Europe, and the United States with emphasis on aesthetic and stylistic qualities. The influences of Eastern textiles on textiles of Europe and the United States.

143. History of Costume Design (4) II. Stabb
Lecture—3 hours; discussion—1 hour. Prerequisite: one course in art history. The history of costume design from the earliest times to the present with emphasis on both aesthetic and functional aspects.

144. History of Interior Design (3) III. The Staff
Lecture—3 hours. Prerequisite: one course in art history. The history of Western interior design from its beginnings in Ancient Egypt through the Classical, Medieval, and Renaissance worlds to modern times.

160A-160B-160C. Textile Design (4-4-4) A: I, III; B: I, II; C: II, III. The Staff (Laky in charge)
Studio—8 hours. Prerequisite: courses 20A and 20B recommended. Exploration of the design and appreciation of hand printed textiles; emphasis on the unique qualities of the individual as producer.

170A-170B-170C. Costume Design (4-4-4) I-II-III. Stabb
Studio—8 hours. Prerequisite: courses 20A and 23 recommended. Studio projects in costume design; consideration of functional and aesthetic factors influencing the historic, contemporary, and projected image of man as expressed through costume.

180A-180B-180C. Interior Design (4-4-4) I, Berteaux; II, Gotelli; III, Gotelli
Studio—8 hours. Prerequisite: Design 21 recommended. Analysis, organization, and solution of interior design problems involving the social, cultural, economic, and aesthetic needs of man. Consideration of the interrelationship of interior design, architectural and landscape design.

190. Proseminar (2) II, III. The Staff
Seminar—2 hours. Prerequisite: design major or consent of instructor. (P/NP grading only.)

191A-D. Workshops in Design (4-12) I, II, III. The Staff (Gotelli in charge)
Seminar—1 hour; studio or field experience—3 hours per unit. Instructor and student determine units. Prerequisite: course 20A, 20B; 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 (1-12) I, II, III. The Staff (Pilisuk in charge)
Field placement—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Supervised internship, off and on campus, in areas of Design including environmental, costume, textile, graphic, museum, display and interior design. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Pilisuk 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 (Pilisuk in charge) (P/NP grading only.)

Development, Resource, and Consumer Economics

(College of Agricultural and Environmental Sciences)

The Major Program

The major in Development, Resource, and Consumer Economics is designed to prepare you for a career in one or more of the following areas: the economics of community, regional and international development; the economics of human resources; the economics of natural resources; and consumer economics. This major enables you to prepare for further studies at the graduate level as well as to pursue career opportunities in government agencies on all levels, non-profit organizations, social agencies, research organizations, and with firms employing economists with this background. New directions of economic application of theory and research to social problems are reflected in this major. Flexibility is provided by options which allow you to focus either on the *natural and agricultural sciences* or on the *social sciences*.

Development, Resource, and Consumer Economics

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
Preparatory Subject Matter	36-37
Written and oral expression (See College requirement, page 70)	8
American History and Institutions†	8
Economic principles (Economics 1A-1B)	10
Statistics (Statistics 13; Economics 12)	4-5
Mathematics, including calculus	6
Depth Subject Matter††	32-33
Theory: Agricultural Economics 100A-100B, Economics 101	13
Statistics: choose two courses from Agricultural Economics 106A, 106B, 155	7-8
Policy and Planning: choose four courses from Agricultural Economics 120, 148; Economics 125A, 125B, 130, 131, 150B; Applied Behavioral Sciences 151, 152; Political Science 100, 174; Environmental Studies 160, 162, 168A, 168B, or the equivalent	12
Breadth Subject Matter†††	32
Natural sciences (including mathematics beyond Preparatory Subject Matter above) and agricultural and environmental sciences (excluding agricultural economics, consumer economics, and applied behavioral sciences)	12 units minimum
Social sciences (excluding economics), history, and philosophy	20 units minimum

†Students meeting the American History and Institutions requirement may substitute Social Science as interpreted under the Social Sciences Breadth Subject Matter requirement.

††Students graduating with this major are required to maintain at least a C average (2.0) in all upper division Agricultural Economics, Consumer Economics, and Economics courses taken at the University.

Dietetics; Dramatic Art

Restricted Electives	24
Specialization requirement:	
(a) Select one or more from the following in the designated area of specialization):	
<i>Development economics:</i>	
Agricultural Economics 108, 148;	
<i>Natural resource economics:</i>	
Agricultural Economics 108, 176;	
<i>Human resource economics:</i>	
Agricultural Economics 150;	
<i>Consumer economics:</i>	
Consumer Economics 141, 142.	
(b) 4 units of Agricultural Economics 190A-190B (required of students seeking departmental honors at graduation) or 4 upper division units of restricted electives.	
Unrestricted Electives	54-56
Total Units for the Major	180

Breadth Subject Matter

Contact departmental advisers for up-to-date lists of courses which are acceptable for this requirement.

Major Adviser. B.S. Zoloth (*Agricultural Economics*).

Information Center for major is located at 105 Voorhies Hall.

Dietetics

(College of Agricultural and Environmental Sciences)

The Major Program

The Dietetics major provides you 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. Dietitians are sought for administrative, therapeutic, teaching, research, and public service positions in hospitals, schools, clinics, and other institutions. You will be qualified for admission to graduate programs in dietetics, nutrition science, public health nutrition and food service management. Clinical Dietetics, Community Nutrition, and Food Service Management are the three options available with the Dietetics major.

Dietetics

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
Preparatory Subject Matter	42-50
Written and oral expression (English I and Rhetoric 1 or 3)	8
Statistics (Statistics 13 or Economics 12)	4-5
Physics (Physics 1A-1B or 2A-2B-2C or 10 or Agricultural Engineering Technology 121, Consumer Technology 17)	4-9
Chemistry, general and organic (Chemistry 1A, 1B, 8A, 8B)	16
Biology (Biological Sciences 1)	5
Bacteriology with laboratory (Bacteriology 2, 3)	4
Computer logic or programming (Consumer Technology 31 or Mathematics 19)	1-8

†Additional restricted electives to be recommended by adviser.

Depth Subject Matter	61-63
Biochemistry (Biochemistry 101A, 101B)	6
Physiology (Physiology 110, 110L)	7
Food Science and Technology 100A, 100B, 101A, 101B	10
Nutrition 110, 111, 111L, 116A, 116B, 190; and 114 or 117 or 118	20-22
Food Service Management 120, 120L, 121, 122, 123	14
Agricultural Economics 112	4
Breadth Subject Matter	17
Principles of economics (Economics 1A)	5
Sociology or cultural anthropology	4
General psychology, Psychology 1	4
Principles of learning or methods of teaching (Applied Behavioral Sciences 173 or Education 110)	4
Unrestricted Electives	50-60
Total Units for the Major	180

Additional Specialization (Optional)

Students wishing to complete an additional specialization in Dietetics may elect one of the series of courses indicated below. Students are not required to elect any of these courses.

<i>Clinical Dietetics</i> specialization, include the following courses:	
Biochemistry laboratory (Biochemistry 101L)	5
Chemistry, qualitative and quantitative analysis (Chemistry 1C, 5)	9
Human Anatomy (Medicine) 101	4
<i>Community Nutrition</i> specialization, include the following courses:	
Nutrition 116AL, 116BL, 118, 119	10
Anthropology 2	4
Sociology 3, 130, 143	12
<i>Food Service Management</i> specialization, include the following courses:	
Agricultural Economics 117	4
Economics 1B, 11A-11B, and 150A	16

Major Adviser. J.S. Stern (*Nutrition*).

Graduate Study. See page 99.

Dramatic Art

(College of Letters and Science)

Robert A. Fahrner, Ph.D., Chairperson of the Department

Department Office, 222 Dramatic Art Building (752-0888)

Faculty

Gene A. Chesley, M.A., Lecturer
 Ruby Cohn, Ph.D., Professor (*Dramatic Art, Comparative Literature*)
 Everard d'Harnoncourt Ph.D., Professor
 Robert A. Fahrner, Ph.D., Professor
 Harry C. Johnson, M.A., Associate Professor
 William E. Kleb, D.F.A., Associate Professor
 Phyllis J. Kress, M.F.A., Lecturer
 Robert K. Sarlos, Ph.D., Professor
 Theodore J. Shank, Ph.D., Professor
 Daniel E. Snyder, Professor
 Alan A. Stambusky, Ph.D., Professor
 Darrell F. Winn, M.A., Lecturer

The Major Program

Dramatic Art, with its classroom courses in each of the scholarly and artistic areas of the discipline, and with its University Theatre Season and its Premiere Season, has the following objectives: to form intelligent theatre-goers as part of a liberal arts education (in both lower division and upper division work); to provide a foundation for potential specialists (primarily in upper division work); and to train specialists for careers in theatre, film, video, education, or related fields (graduate work).

The University Theatre

Each year the Department of Dramatic Art presents a series of stage productions of outstanding dramas from various periods and countries. 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.

Guest Artists' Program. The Department of Dramatic Art periodically engages professional guest artists to work with students in productions and in creative workshops.

Dramatic Art

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

Dramatic Art 124A, 124B, 127A, 156, 157, 158, 159, 160A, 190	35
Dramatic Art 127B or 160B	4

In exceptional cases, with the adviser's consent, the student may petition to substitute up to 8 units from other Dramatic Art courses for any of the above courses.

Additional Requirements

During the undergraduate career majors are to participate in at least eight dramatic productions (exclusive of student or 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 61

Minor Program Requirements:

	UNITS
Dramatic Art	19
G.A. Chesley, 124A, 160A, 156, 157 or 158, 159	19

Major Advisers. G.A. Chesley, T.J. Shank.

Transfer Students. If you are a transfer student you should see the major adviser for an evaluation of your experience.

Teaching Credential Subject Representative. G.A. Chesley, T.J. Shank. See page 105 for 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, playwriting, or any combination of these), and Ph.D. (theatre research) degrees. Detailed information may be obtained by contacting the Graduate Adviser.

Graduate Adviser. E. d'Harnoncourt.

Lower Division Courses

10. Introduction to Acting (3) I, II, III. The Staff Laboratory-discussion—4 hours. Fundamentals of movement, speech, theatre games, and improvisations. Selected reading and viewing of theatre productions intended for students not specializing in Dramatic Art.

15. The Art of the Cinema (4) I, III. d'Harnoncourt Lecture—3 hours, laboratory—2 hours. The cinema as an art form, its relation to other arts, its evolution with emphasis on the significant modern contributions.

15L. Introduction to Filmmaking (2) I, III. d'Harnoncourt Lecture-demonstration—1 hour; laboratory—3 hours. Prerequisite to be taken in conjunction with course 15 or by consent of instructor. Students in small groups will write, shoot, and edit 8 mm films, and prepare sound tracks for them.

20. Introduction to Dramatic Art (4) I, Kleb

Lecture—3 hours; discussion—1 hour. Understanding and appreciation of both the distinctive and collaborative contributions of playwright actors, 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, The Staff

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, The Staff

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, Snyder

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) I, II, III, 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) III, 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.

28. Visual Arts and Theatre (4) I, Snyder

Lecture-discussion—4 hours. The correlation between the visual arts and design for performance. Intended for students in the visual arts as well as for prospective majors.

30. Theatre Laboratory (1-5) I, II, III, The Staff

Prerequisite: course 25 or consent of instructor. Projects in acting, production, scene design, costume, lighting, directing, and playwriting. Participation in departmental productions. May be repeated for credit up to a total of 8 units.

70. Theatre in Performance (4) III, Kleb

Lecture-seminar—4 hours. Theatre attendance and appreciation; traditional and experimental. Field trips, readings, discussions. Intended for students not specializing in Dramatic Art as well as for prospective majors. May be repeated once for credit.

98. Directed Group Study (1-5) I, II, III, The Staff (Chairperson in charge)

Directed group study of a special topic. 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, d'Hamoncourt

Lecture—3 hours; laboratory—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, Johnson

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 (3) I, Chesley

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 24 or consent of instructor. Scene design: drafting methods, working drawings, rendering techniques, scale models, methods and materials of scenery construction.

124B. Principles of Theatrical Design (4) II, Snyder

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 124A. Analysis of Plays in terms of scene design,

elements of design, execution of designs for modern and period plays.

124C. Principles of Theatrical Design (3) III, Winn

Lecture—2 hours; laboratory—2 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 (3) II, Kress

Lecture—2 hours; laboratory—2 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, Chesley

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.

127A. Principles of Directing (4) I, Stambusky

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, Stambusky

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, Sarlos

Lecture—4 hours. The history of the theatre from Colonial times to the present. Readings of selected plays. Offered in odd-numbered years.

153. The American Musical (4) II, Kleb

Lecture—4 hours. History and development of the American Musical as a unique theatrical form.

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 even-numbered years.

156. Theatre and Drama: Aeschylus to Machiavelli (4) I, Sarlos

Lecture—4 hours. Selected plays and the history of the theatre from ancient Greece through the Italian and Spanish Renaissance.

157. Theatre and Drama: Shakespeare to Schiller (4) II, Sarlos

Lecture—4 hours. Selected plays and the history of the theatre from the English Renaissance through German and French Romanticism.

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) III, 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, Shank

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.

161. Collective Theatre (4) III, Shank

Workshop—4 hours. Prerequisite: experience in at least two of the following areas—playwriting, directing, design, acting, kinetic or environmental sculpture; consent of instructor. Participation in the collective creation of a theatre piece. May be repeated twice for credit.

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, costume lighting, directing, and playwriting. Participation in departmental productions. May be repeated for credit.

***190. Senior Projects in Dramatic Art** (4) II, III, Fahrner, d'Hamoncourt

Seminar—3 hours; consultation, seminar, rehearsal, laboratory, research papers. Prerequisite: senior standing in Dramatic Art. Study of specific areas of dramatic art culminating in independent creative and scholarly research projects.

192. Internship in Dramatic Art (1-12) I, II, III, The Staff (Chairperson in charge)

Field work. Prerequisite: upper division or graduate standing with major in Dramatic Art or Individual Major with Dramatic Art as an area; upper division course related to the project; consent of instructor and Department Chairperson. Internship outside the University enabling students to practice their skills. May be repeated for credit for a total of 12 units. (P/NP grading only.)

197T. Tutoring in Dramatic Art (1-4) I, II, III, The Staff (Chairperson in charge)

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, Sarlos Seminar—3 hours. 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.

212. Advanced Stage Movement (2) II, III, The Staff

Laboratory—4 hours. Prerequisite: open to advanced undergraduates with consent of instructor. Rhythmic movement patterns relating to acting problems in classic and modern plays.

221A. Special Problems in Advanced Acting (4) I, Johnson

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 Renaissance.

221B. Special Problems in Advanced Acting (4) II, The Staff

Seminar—2 hours; laboratory—4 hours. Prerequisite: consent of instructor. Advanced acting problems relating to plays selected from the Renaissance to Romanticism.

221C. Special Problems in Advanced Acting (4) III, The Staff

Seminar—2 hours; laboratory—4 hours. Prerequisite: consent of instructor. Advanced acting problems in plays drawn from Romanticism to the present.

224A. Visual Problems in Theatre and Performance (4) I, Snyder

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, and Design majors.

224B. Advanced Principles and Theories of Theatrical Design (4) II, Chesley

Seminar—3 hours. Selected problems in the design of stage scenery and costumes; practice in design.

224C. Advanced Principles and Theories of Theatrical Design (4) III, Chesley

Seminar—3 hours. Design of a production for three different types of theatres: open stage, arena, and proscenium.

227. Seminar in Directing Theory: Realism (4) I, Kleb

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 even-numbered years.

228. Seminar in Directing Theory: Non-Realism (4) I, Kleb

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 even-numbered years.

229A. Special Problems in Directing (5) I, Stambusky

Seminar—2 hours; laboratory—2 hours; rehearsal—4 hours. Prerequisite: consent of instructor. Specialized directorial procedures in styles of drama. Projects in directing scenes selected from plays of the Greek to Renaissance periods.

229B. Special Problems in Directing (5) II, The Staff

Seminar—2 hours; laboratory—2 hours; rehearsal—4 hours. Prerequisite: consent of instructor. Projects in directing scenes selected from plays from the Renaissance to the Romantic periods.

229C. Special Problems in Directing (5) III, The Staff

Seminar—2 hours; laboratory—2 hours; rehearsal—4 hours. Prerequisite: consent of instructor. Projects in directing scenes selected from plays from the emergence of Realism to the present.

***230A-230B. Classic and Medieval Theatre** (4-4) II-III, Fahrner, Sarlos

Seminar—3 hours. 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. (Deferred grading only, pending completion of sequence, can be in effect.)

235A-235B. Renaissance and Baroque Theatre (4-4) II, III. Fahrner, Sarlos
Seminar—3 hours. 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. (Deferred grading only, pending completion of sequence, can be in effect.)

***240A-240B. Neoclassic and Romantic Theatre** (4-4) II-III. Fahrner, Sarlos
Seminar—3 hours. 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. (Deferred grading only, pending completion of sequence, can be in effect.)

250. Modern Theatre (4) II. Sarlos
Seminar—3 hours. 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 even-numbered years.

259. Contemporary Theatre (4) II. Cohn
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. Shank
Seminar—3 hours. Dramatic structure, character, and dialogue. Advanced projects in playwriting.

265. Theory of Dramatic Art (4) I, Fahrner
Seminar—3 hours. Theory and aesthetic principles of dramatic art as a fine art. Offered in even-numbered years.

269. Contemporary Avant-garde Theatre (4) III. Shank
Seminar—3 hours. Present-day experimental concepts and practice. Scholarly paper using publication format. Offered in even-numbered years.

280. Theatre Laboratory (1-12) I, II, III. The Staff
Advanced practice in acting, designing, directing, playwriting, and technical theatre.

292. Contemporary Theatre Practice (2) III. The Staff
Seminar—2 hours. Seminar in the techniques and requirements for pursuit of a career as a theatre professional. Includes survey of Broadway, Off-Broadway, Regional, University, and Community theatres. Offered in even-numbered years.

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 Courses

413. Stage Make-up (1) II. The Staff
Lecture-laboratory—2 hours. Prerequisite: consent of instructor. Lectures, demonstrations, and practical work in aspects of theatrical make-up.

East Asian Studies

(College of Letters and Science)

Program Office, 371 Voorhies Hall (752-0439)

Committee in Charge

- Don C. Price, Ph.D. (*History*), Committee Chairperson, Fall Quarter
- Mary H. Fong, Ph.D. (*Art*)
- Key H. Kim, Ph.D. (*Oriental Languages and Civilizations*)
- Earl H. Kinmonth, Ph.D. (*History*)
- Whalen W. Lai, Ph.D. (*Religious Studies*)
- Janet Shibamoto, M.A. (*Oriental Languages and Civilizations*)

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, combining sustained work in an oriental language with courses on East Asian countries. 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. Students are required to develop a special field (e.g., anthropology, history, oriental languages) within the major, to be chosen in consultation with their adviser.

Since six quarters of language work are required, students normally should apply to this program in their sophomore year.

East Asian Studies

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	48
History 9A, 9B	8
One course from Art 1D, 20, Comparative Literature 53A, History 90A, 90B, Political Science 9C, Religious Studies 4A, 70	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)	36
Depth Subject Matter	36
History 192B-190C or 194B-194C	8
Political Science 148A or 148B	4
Anthropology 190 or 191 or Sociology 147	4
At least 20 units from the following courses, as approved by the Committee in charge	20
Agricultural Economics 125;	
Anthropology 109, 110, 111, 112, 120, 122, 123, 124, 128, 162, 190, 191, 192;	
Art 163A, 163B, 164; Chinese 101, 111, 162, 171; Geography 143; History 102G, 102H, 102N, 191A, 191B, 190A, 190B, 190C, 193, 194A, 194B, 194C, 194D, 195; Japanese 121; Oriental Languages and Civilizations 100, 150; Political Science 132, 133, 137, 142, 145, 148A, 148B; Religious Studies 172; Sociology 118, 141, 147, 170. (Other appropriate courses,* including individual and group study courses (198, 199), as approved by the Committee in charge.)	
Total Units for the Major	84

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 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 course (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 upperdivision 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. China: D. Gibbs (*Oriental Languages and Civilizations*), D.C. Price (*History*); Japan: E. H. Kinmonth (*History*).

Courses in East Asian Studies. The following courses are open to students throughout the campus. Refer to departmental listings for course descriptions.

Anthropology:

- 190. Cultures of China and Korea
- 191. Culture of Japan

Art:

- 1D. Asian Art
- 20. Myths and Symbols in Chinese Art
- 163A. Chinese Art
- 163B. Chinese Painting
- 164. The Arts of Japan

Economics:

- 171. Economy of East Asia

History:

- 9A. History of East Asian Civilization (China)
- 9B. History of East Asian Civilization (Japan)
- 90A. Modernization of China
- 90B. Modernization of Japan
- 102G. Undergraduate Proseminar: China to 1800
- 102H. Undergraduate Proseminar: China since 1800
- 102N. Undergraduate Proseminar: Japan
- 191A. Classical China
- 191B. High Imperial China
- 192A, 192B. Late Imperial China: Background to Revolution
- 192C. The Chinese Revolution
- 193. 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. Topics in Japanese Social and Economic History
- 195. Modern China and the West

Language:

- Chinese 1-2-3. Elementary Modern Chinese
- Chinese 4-5-6. Intermediate Modern Chinese
- Chinese 101. Classical Chinese
- Chinese 111. Modern Chinese Literature: Reading and Discussion
- Japanese 1-2-3. Elementary Modern Japanese
- Japanese 4-5-6. Intermediate Modern Japanese
- Japanese 121. Modern Japanese: Reading and Discussion
- Oriental Languages and Civilizations 100. Languages of Eastern Asia

Literature in Translation:

- Comparative Literature 53A. Literature of the Eastern World: China and Japan

Political Science:

- 9. Introduction to Contemporary Problems of Asia
- 132. The American Role in East Asia
- 133. International Relations: East Asia
- 148A, 148B. Government and Politics in East Asia

Religious Studies:

- 70. Introduction to Buddhism
- 172. Ch'an (Zen) Buddhism

Sociology:

- 147. Sociological Perspectives on East Asia

Ecology (A Graduate Group)

R. Merton Love, Ph.D., Chairperson of the Group
Group Office, 2148 Wickson Hall (752-6751)

Faculty

The Group includes faculty from 45 departments in five schools and colleges.

Graduate Study. The Graduate Group in Ecology offers the M.S. and Ph.D. degrees in three broad study options: (1) biological, (2) human, and (3) physical and chemical ecology. Several areas of specialization are possible in each of the three. Details of the program may be obtained from the Chairperson of the Group.

Preparation. Appropriate preparation is undergraduate work in one of the biological, social or behavioral, and physical sciences, mathematics or engineering. But note that all applicants to the (1) biological and (3) physical-chemical areas will nor-

ally be expected to have completed a one-year sequence in basic biology, in elementary chemistry (organic chemistry strongly recommended), in elementary physics; a course in statistics; calculus and computer programming or other suitable mathematical training; and a course in ecology. Applicants to the (2) human ecology area will normally be expected to have completed a one-year sequence in basic biology; a course in evolution or genetics; two courses in chemistry; one course in physics; one course in calculus, one in statistics; and a course in ecology. Each of the three broad areas requires certain advanced preparation appropriate to the area.

Breadth Requirement. All degree candidates are required to take a course from each of the following three study areas. Recommended:

- Biological Ecology courses: Environmental Studies 100 (general ecology), Zoology 125 (animal ecology), Entomology 104 (insect ecology), or Botany 117 (plant ecology).
- Human Ecology courses: Environmental Studies/Anthropology 101 (principles of human ecology), Environmental Studies/Anthropology 141 (cultural ecology), Psychology 144 (environmental awareness), or Geography 170 (cultural ecology).
- Physical and Chemical Ecology courses: Environmental Studies 151 (limnology), 151L (limnology laboratory), Environmental Studies/Geology 150A (physical and chemical oceanography), or Atmospheric Science 133 (biometeorology).

Graduate Adviser. R. M. Love.

Related Courses. Many departments offer such courses. A list of these courses is available at the Group Office.

Courses in Ecology

Graduate Courses

201. Advanced Biological Ecology (4) II. Salt (Zoology), Wilson (Environmental Studies)
Lecture—3 hours; discussion—1 hour. Prerequisite: an upper division course in either plant or animal ecology (recommend both) and graduate standing. An examination of major topics in theoretical ecology.

210. Advanced Topics in Human Ecology (4) III. Sabatier (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.

***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 odd-numbered years. (Same course as Anthropology 211.)

212A. Environmental Policy Analysis (4) III. Sabatier (Environmental Studies)
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 odd-numbered years. (Same course as Environmental Studies 212A.)

212B. Environmental Policy Analysis: Evaluation (4) I, Schwartz, Wilen (Environmental Studies), Cramer (Sociology)
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 odd-numbered years. (Same course as Environmental Studies 212B.)

213. Advanced Demography (4) III. Cramer (Sociology)
Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies 145, Sociology 170, and Ecology 210, or consent of instructor; graduate standing. An analysis of the social and economic determinants of mortality, fertility, and population size; of selected consequences of demographic trends; and of how demography is related to human ecology. Special emphasis on methods of analysis and on contemporary societies. Offered in even-numbered years.

220. Transport Processes in the Biosphere (3) I, Myrup (Land, Air and Water Resources)
Lecture—2 hours; discussion—1 hour. Prerequisite: undergraduate training in integral and differential calculus, college physics and general biology, graduate standing, and Atmospheric Science 123. A unified approach to the study of transport processes in biological systems; conservation laws and their mathematical representation; similarity principles; the phenomenon of turbulence; role of turbulent and molecular transport in specific ecosystems. Offered in even-numbered years.

230. Analysis of a Selected Ecosystem (4) I, Sabatier, Foin (Environmental Studies)
Lecture—3 hours; discussion—1 hour; field trip. Prerequisite: graduate standing. Application of basic ecological principles to the interpretation of biotic and abiotic interrelationships of a particular ecosystem (Northern California Coast). Recent advances in theory, technique, and basic information are emphasized. Lectures will be given by specialists from several fields. May be repeated for credit.

290. Seminar in Ecology (1-3) I, II, III. The Staff (Chairperson in charge)
Seminar—1-3 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 topics under consideration. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. Perception, definition, and attack on a selected ecological problem, drawing on the expertise of faculty from different departments in the Graduate Group in Ecology. (Sec. 1, letter grading; all other sections, S/U grading only.)

Economics

(College of Letters and Science)

Frank C. Child, Ph.D., Chairperson of the Department

Department Office, 380 Kerr Hall

Faculty

Andrzej Brzeski, Ph.D., Professor
Frank C. Child, Ph.D., Professor
Robert A. Driskill, Ph.D., Assistant Professor
Bruce Glassburner, Ph.D., Professor
Victor P. Goldberg, Ph.D., Professor
W. Eric Gustafson, Ph.D., Lecturer
Timothy D. Hau, M.A., Acting Assistant Professor
L. Jay Helms, Ph.D., Assistant Professor
^{2,3}Hiroimitsu Kaneda, Ph.D., Professor
Elsie M. Knoer, Ph.D., Assistant Professor
Peter H. Lindert, Ph.D., Professor
Thomas Mayer, Ph.D., Professor
Martin P. Oettinger, Ph.D., Associate Professor
Alan L. Olmstead, Ph.D., Professor
^{3,4}John E. Roemer, Ph.D., Associate Professor
²Linda Shaffer, Ph.D., Assistant Professor
¹Steven Sheffrin, Ph.D., Assistant Professor
T. Y. Shen, Ph.D., Professor
²Ross M. Starr, Ph.D., Professor
Elias H. Tuma, Ph.D., Professor
¹Leon L. Wegge, Ph.D., Professor

The Major Program

Economics is the study of human social arrangements and institutions used in mankind's efforts to satisfy material wants. The economic problem is to maximize satisfaction of society's material wants within the limits established by the availability of resources and the state of our knowledge, with due allowance for noneconomic values. To maximize the economy's economic welfare, a society must utilize scarce resources fully and efficiently in the production of goods of highest social priority and then distribute that output equitably among its members.

A major in economics will assist the student to learn how economists examine these questions, and is an appropriate major for undergraduates contemplating graduate study in business administration, law, regional planning or public affairs.

Economics

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	15
Economics 1A-1B	10
Economics 12	5
<i>(At least a C average in the above courses.)</i>	
Depth Subject Matter	36
Economics 100 or 100M; 101	10
One course from 110A, 110B, 111A, 111B	4
One course sequence from Economics 110A-110B; 110A-111A; 110A-111B; 111A-111B; 110B-111B; 115A-115B; 116-117; 121A-121B; 125A-125B; 130-131; 136A, 136B, 150A-150B; 151A-151B; 150A-151A; 160-161	8-10
Additional economics courses to achieve a minimum of 36 upper division units	12-14
Total Units for the Major	51

Recommended

Students considering graduate study in economics or business administration are strongly urged to take Mathematics 16A, 16B.

It is highly recommended, but not required, that students take Economics 100 prior to 101; and the Department also suggests that these courses be taken as soon as possible after the introductory course. 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 Highest Honors. To graduate with Highest Honors in Economics, a student must earn in all upper division economics classes a grade-point average equal to that required by the College in all University of California work.

Major Advisers. A. Brzeski, W. E. Gustafson, T. D. Hau, L. J. Helms, H. Kaneda, E. M. Knoer, P. H. Lindert, M. P. Oettinger, L. Shaffer, E. H. Tuma.

American History and Institutions. This University requirement can be satisfied by completion of Economics 111A, 111B. (See also page 61.)

Teaching Credential Subject Representative. A. Brzeski. See page 105 for the Teacher Education Program.

Graduate Study. Students who meet the admission requirements of the Graduate Division 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).

NOTE: For key to footnote symbols, see page 130.

Economics

For information on admission to graduate study, degree requirements, and financial aid, consult the *Announcement of the Graduate Division* and contact the chairperson of the departmental graduate committee.

Graduate Advisers. R. A. Driskill, B. Glassburner, V. P. Goldberg, T. Mayer, A. L. Olmstead, S. Shefrin, T. Y. Shen, R. M. Starr, L. L. Wegge.

Courses in Economics

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.

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.

11A. Elementary Accounting (4) I. Oettinger
Lecture—3 hours; laboratory—2 hours. The history and basic concepts of accounting; the ledger, journals, income statement, and the balance sheet; inventory valuation; depreciation; introduction to cost accounting; analysis of financial statements; social accounting. (Deferred grading only, pending completion of 11A-11B sequence.)

11B. Elementary Accounting (3) II. Oettinger
Lecture—2 hours; laboratory—2 hours. Prerequisite: course 11A. Continuation of course 11A. (Deferred grading only, pending completion of 11A-11B sequence.)

12. Introduction to Quantitative Methods in Economics (5) I, _____; III. Gustafson

Lecture—4 hours; laboratory—2 hours. Prerequisite: two years of high school algebra. Methods of analyzing quantitative economic data including descriptive statistics; sampling and statistical inference index numbers, correlation, and time series. Emphasis on the logic of procedures, interpretation, and application. Not open to students having credit for Statistics 13, or Sociology 46A-46B.

***49. Lower Division Seminar** (1-3) I, II, III. The Staff (Chairperson in charge)
Seminar—1-3 hours. Prerequisite: lower division standing and consent of instructor. (P/NP grading only.)

92. Internship and Field Work (1-12) I, II, III. Oettinger
Laboratory—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 course 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: courses 1A-1B. Price and distribution theory under conditions of perfect and imperfect competition; welfare economics. Not open to students who have received credit for course 100M or Agricultural Economics 100B or 110A.

100M. Intermediate Micro Theory (5) I, II. The Staff (Chairperson in charge)
Lecture—4 hours; discussion—1 hour. Prerequisite: courses 1A-1B; Mathematics 16A, 16B. Price and distribution theory under conditions of perfect and imperfect competition. Welfare economics. Extensive use of algebra and the calculus. Not open to students who have completed course 100. Agricultural Economics 100A or 100B.

101. Intermediate Macro Theory (5) I, II, III. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Theory of income, employment and prices under static and dynamic conditions.

105. History of Economic Thought (4) III. Shen
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Historical survey of economic doctrine: the Classical School and its antecedents. Neoclassical thought, criticism of classical thought, emergence of modern economic thought.

110A. Economic History (4) I. Tuma
Lecture—3 hours; to be arranged—1 hour. Prerequisite: 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) II. Tuma
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) II. Olmstead
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. Olmstead
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-115B. Economic Development (4-4) I-II. Glassburner, Kaneda

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Theories of economic development and underdevelopment, economic policy for growth and development. Contemporary and historical case studies.

116. Economic Systems (4) II. Brzeski
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Critical examination of major economic systems; their goals and institutions; capitalism, fascism, and varieties of socialism; problems of economic planning in USSR, India, China, and other industrializing economies.

117. The Soviet Economy (4) III. Brzeski
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Survey of Soviet economic development: economic organization, methods of planning, and performance.

***118. Political Economy of Agrarian Reform** (4) II. Tuma
Lecture—3 hours; discussion—1 hour to be arranged. Prerequisite: courses 1A-1B or the equivalent. Theory and concepts of reform; illustrations from various periods and regions. Impact on economic development; problems of change and stability. Relationship to economic, social, and political institutions.

119. Marxian Economics (4) III. Roemer
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, 100 (or 100M). Marxian economic theories, including theories of value, surplus value and exploitation; accumulation, the business cycle and crises; the role of the State and its relation to classes; imperialism. Writings of Marx and economists in the Marxian tradition will be studied.

121A. Industrial Organization (4) II. Shen
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, 100 (or 100M), 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. Goldberg
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. Gustafson
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.

125A-125B. Urban Economics (4-4) I-II. Shaffer
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B, 100 (or 100M), or consent of instructor. Analysis of the structure and growth of the urban economy. Topics include: land use, residential and business growth, housing markets, transportation; metropolitan fiscal problems; urban decay and renewal, poverty, discrimination; public policy.

130. Public Microeconomics (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 100M, 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) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 100M, or consent of instructor, course 101 recommended. Financing government expenditures. Efficiency and equity aspects of taxes, including personal income tax, property tax, and sales tax; tax loopholes and tax reform; revenue sharing; macroeconomic effects of taxation vs. debt financing.

134. Corporation Finance (4) I, Shen
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, 11A, 12 and Mathematics 16A. 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.

135. Money, Banks and Financial Institutions (3) I. Mayer
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) II. Mayer
Lecture—3 hours; discussion—1 hour. Prerequisite: course 101. Monetary theory, the impact of changes in the quantity of money and of liquid assets on money income.

136B. Monetary Policy (4) III. Mayer
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 135 and 136A. Evaluation of monetary policy, its impact on the economy and past performance, the problem of inflation.

140. Introduction to Econometrics (4) III. Helms
Lecture—3 hours; laboratory—2 hours. Prerequisite: course 12 or the equivalent; 100 or 100M, 101; Mathematics 16A-16B or 21A. Introduction of problems of observation, estimation and hypothesis 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.

***150A. Economics of Trade Unionism** (4) II. Oettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1A-1B. Theory and philosophy of labor movements in America. Western Europe and the developing world; the history, structure and government of American Trade unions; theory and practice of collective bargaining. Offered in even-numbered years.

***150B. Labor and Public Policy** (4) III. Oettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: course 150A or consent of instructor. The economic impact of labor legislation; industrial disputes, their settlement and government intervention; unions and the anti-trust laws; the union interest in welfare programs. Offered in even-numbered years.

151A. Economics of the Labor Market (4) II. Shaffer
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 100M. 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. Offered in odd-numbered years.

151B. Economics of Human Resources (4) III. Shaffer
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. Offered in odd-numbered years.

160. International Trade (4) I, Kaneda
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, 100 or 100M, or consent of instructor. Students who have completed Economics 162 may only receive 2 units credit for course 160. International trade theory; impact of trade on the domestic and the world economies; public policy toward external trade.

161. International Finance (4) II. Kaneda
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, 101 or consent of instructor. Students who have completed Economics 162 may only receive 2 units credit for course 161. International money and capital markets and their impact on the domestic and world economies; international financial institutions and policies.

162. International Economic Relations (4) III. Child
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 160 or 161 may not receive credit for this course.

170. Economy of the Middle East (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 Middle East. Consult department for course scheduling.

171. Economy of East Asia (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 East Asia. Consult department for course scheduling.

172. Economy of South Asia (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 South Asia. Consult department for course scheduling.

173. Economy of South-East Asia (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 South East Asia. Consult department for course scheduling.

174. Economy of Europe (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 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) I, II, III. The Staff
Lecture-discussion-seminar—4 hours. Prerequisite: consent of instructor. Selected topics in economic analysis and public policy. Variable content. May be repeated for credit.

194HA-194HB-194HC. Special Study for Honors Students (3-2-2) I-II-III. The Staff (Gustafson in charge)
Seminar. Prerequisite: major in Economics with senior standing; consent of instructor. 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)
Undergraduate tutors will lead small voluntary 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) II. The Staff (Child in charge)
Lecture—4 hours; discussion—1 hour. Prerequisite: Economics/Agricultural Economics 103, Mathematics 16A-16B, or consent of instructor. Theories of the behavior of individual economic agents. Characteristics of market equilibrium in perfectly competitive, monopolistic, and monopsonistic markets. (Same course as Agricultural Economics 200A.)

200B. Microeconomic Theory (5) III. The Staff (Child in charge)
Lecture—4 hours; discussion—1 hour. Prerequisite: course 200A or consent of instructor. Introduction to theorems of

welfare economics in a general equilibrium, linear economic models, externalities and market failure, social welfare functions. (Same course as Agricultural Economics 200B.)

200C. Microeconomic Theory (4) I. The Staff (Child in charge)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A, 200B. Further topics in microeconomics, including risk and uncertainty, capital theory, separability and aggregation, and other topics. (Same course as Agricultural Economics 200C.)

200D. Macroeconomic Theory (4) II. Sheffrin
Lecture—3 hours. Macro static theory of income, employment, and prices.

200E. Macroeconomic Theory (4) III. Wegge
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 103, 200B, and 200D; Mathematics 16A-16B; or consent of instructor. Macrodynamics theory of income, employment, and prices.

201A. History of Economic Thought (4) I. Shen
Lecture—3 hours; discussion—1 hour. Economic thought from the classical Greece era to Modern Times.

***201B. History of Economic Thought II** (4) I. Shen
Lecture—3 hours; discussion—1 hour. Origins and emergence of modern economic analysis. Offered in even-numbered years.

***202. Topics in Economic Theory** (4) I.
Seminar—4 hours. Prerequisite: courses 200A through 200E or consent of instructor. Recent developments in economic theory.

203A. Advanced Economic Theory (4) III. Starr
Seminar—4 hours. Prerequisite: course 200C. Advanced topics in the theory of the firm, distribution theory; welfare economics.

203B. Advanced Economic Theory (4) I. The Staff
Seminar—4 hours. Prerequisite: courses 200C and 200E. General equilibrium theory; capital theory; growth theory.

204. Microeconomic Analysis (5) I. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: course 100 (or 100M) or Agricultural Economics 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 Agricultural Economics 204.)

205. Macroeconomic Analysis (5) II. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: course 101, Mathematics 16A, 16B, or the equivalent. Income, employment and the price level, money, income distribution, capital theory, growth theory, government policies, empirical models and methods.

207. Special Topics in Mathematical Economics (4) II. The Staff
Seminar—3 hours. Prerequisite: courses 203A and 203B or consent of instructor. Advanced topics in mathematical economics. Contents may vary from one year to another.

210A. Economic History (4) I. Tuma
Seminar—3 hours. Method and theory of economic history. Critical analysis of the methodology of economic history and theories of economic change as illustrated by major economic phenomena drawn from the history of different countries.

210B. Economic History (4) II. Tuma
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.

210C. Economic History (4) III. 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.

210D. Economic History (4) III. Tuma, Olmstead
Seminar—4 hours. Prerequisite: a graduate course in economic history. Selected topics and issues, emphasis on current research.

215A. Economic Development (4) I. Glassburner
Seminar—3 hours; discussion—1 hour. Prerequisite: bachelor's degree in Economics or the equivalent, or consent of instructor. Theories of economic development as they relate to developing nations; demographic problems; distribution issues in economic development. (Same course as Agricultural Economics 215A.)

215B. Macroeconomic Development (4) II. Kaneda
Seminar—3 hours; discussion—1 hour. Prerequisite: course 215A. The macroeconomics of economic development; monetary policy problems; fiscal problems, international trade; specific country studies. (Same course as Agricultural Economics 215B.)

215C. Economic Development in Agriculture: Policy and Planning (3) III. McCalla
Lecture—3 hours. Prerequisite: course 215A. Agriculture in the structure of developing nations; its role in economic development; agriculture and national planning; sectoral policies relating to prices, inputs, productivity, and marketing; international aspects of trade, aid, and technical assistance; country case studies. (Same course as Agricultural Economics 215C.)

215D. Development Programming (4) III. Kaneda
Seminar—3 hours; discussion—1 hour. Prerequisite: courses 215A, 215B or 215C, 200B, 200E. Analysis of development plans, programs and policies. Application of input-output, programming, and operations research. Techniques of project evaluation. (Same course as Agricultural Economics 215D.)

216. Economic Systems (4) II. Brzeski
Lecture—4 hours. Comparative study of economic systems, with reference to their organization and institutions, their values and goals, and their economic performance.

217. Economics of Planning (4) III. Brzeski
Lecture—4 hours. Theories and principles of economic planning under various economic systems.

219. Marxian Economic Theory (4) III. Roemer
Lecture—4 hours. Prerequisite: course 103 or Mathematics 16A-16B or linear algebra. Marx's dialectical approach to economics; labor theory of value and exploitation; the transformation problem; schemes of production and reproduction; capital accumulation; falling rate of profit; theories of immiseration, crisis and growth; labor process under capitalism.

221A. Industrial Organization (4) II. Shen
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. Goldberg
Lecture—3 hours; to be arranged—1 hour. Prerequisite: course 221A. Social standards and public policies toward the business sector of the economy.

222. Law and Economics (4) III. Goldberg
Lecture—2 hours; seminar—2 hours. Prerequisite: one year of law school; course 200A or consent of instructor. Studies the effects of legal rules on resource allocation and applies economic analysis to explicate problems in torts, property, and contracts.

225A. Urban Economics (4) II. The Staff
Lecture—2 hours; discussion—2 hours. Prerequisite: course 200A or 204. Application of economic theory and quantitative methods to the urban economy: location, structure and growth.

225B. Urban Economics (4) III. The Staff
Lecture—2 hours; discussion—2 hours. Prerequisite: course 225A. Urban problems and urban public economics; housing, transportation, discrimination, local public goods and urban fiscal problems.

230A. Public Finance (4) I. Helms.
Lecture—2 hours; seminar—2 hours. Welfare economics, externalities, public and merit goods, local public goods, transactions costs and market failure, benefit-cost analysis, politics of collective choice, topics (e.g., economics of education, transfers in income and in-kind, consumer protection, pollution, transportation and congestion).

230B. Public Finance (4) II. Helms.
Lecture—2 hours; seminar—2 hours. Taxation and stabilization; distributional equity, shifting and incidence, theory of optimal taxation, analysis of personal income tax, corporation income tax and other taxes, tax reform, revenue sharing, monetary and fiscal policy, debt management, burden of debt.

***235A-235B. Monetary Theory** (3-3) I-II. Mayer
Lecture—3 hours. Prerequisite: course 200D (may be taken concurrently) or the equivalent. The quantity theory, post-Keynesian monetary theory, the portfolio approach. The main focus is on the conflict between monetarism and Keynesianism.

***235C. Monetary Policy** (3) III. Starr
Lecture—3 hours. Goals and problems of implementation of monetary policy. Impact of monetary changes on income; resource allocation effects, and lags. The problem of rules vs. authorities; monetary aspects of the Great Depression.

240A. Econometric Methods (4) III. The Staff
Lecture—4 hours; term paper. Prerequisite: Statistics 130B and course in linear algebra. Statistical models and their use in estimation of economic relationships; single and multiple equation systems. (Same course as Agricultural Economics 240A.)

240B. Advanced Econometrics: Theory (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 240A; Statistics 131A, 131B-131C recommended. Multivar-

Education

iate analysis, specification analysis, simultaneous equation models, identification, estimating methods, small sample properties. (Same course as Agricultural Economics 240B.)

240C. Advanced Econometrics: Applications (3) II. The Staff
Lecture—3 hours. Prerequisite: course 240A. Time series analysis and distributed lags, pooling of time series and cross-section data, Bayesian analysis, applications for prediction and policy. (Same course as Agricultural Economics 240C.)

250A. Labor Economics (4) III. Oettinger
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) II. Shaffer
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.

260A. International Economics (4) I. Child
Lecture—3 hours discussion—1 hour. Theory of trade determinants; gains from trade; tariffs and effective protection; economic unions.

260B. International Economics (4) II. Kaneda
Lecture—3 hours; discussion—1 hour. Balance of payments adjustment mechanisms; foreign exchange markets; theories of balance of payments policy and international monetary mechanisms.

***260C. International Economics** (4) III. Wegge
Seminar—4 hours. Prerequisite: courses 200C, 200E, 240A, and 260A. Survey of current literature in international Trade theory.

280. Orientation to Economic Research (2) III. Mayer.
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.)

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.)

Barbara J. Merino, Ph.D., Assistant Professor
Douglas L. Minnis, Ed.D., Senior Lecturer
Susan A. Ostergard, Ed.D., Lecturer in and
Supervisor of Teacher Education
Victor A. Perkes, Ed.D., Lecturer in and
Supervisor of Teacher Education
Jonathan H. Sandoval, Ph.D., Associate
Professor

Julius M. Sassenrath, Ph.D., Professor
S. Joan Skinner, M.A., Lecturer in and
Supervisor of Teacher Education
Carlton J. Spring, Jr., Ph.D., Associate Professor
Leroy F. Troutner, Ph.D., Associate Professor
David R. Wampler, Ph.D., Lecturer in and
Supervisor of Teacher Education
*George D. Yonge, Ph.D., Professor

Teacher Education Curricula

For a statement of complete requirements and appointments with credential counselors, apply to the departmental office. Applicants for the credential program should consult the department early in the Fall Quarter of the senior year. (See also page 105.)

Credential Counselors: Multiple Subject. H. G. Bacon, J. Garritson, M. Gatheral, S. A. Ostergard, S. J. Skinner, D. R. Wampler. **Bilingual Emphasis.** B. J. Merino.

Credential Counselors: Single Subject. W. A. Davis, B. Liebert, J. E. Lowry, V. A. Perkes.

(The Department 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 teaching credential, (3) obtain a master's degree in education or allied field, (4) obtain a Ph.D. degree in education, (5) enter a profession that focuses on work with people, (6) seek employment in governmental or industrial training programs, or (7) obtain a better understanding of the issues and concerns of public and private education.

	UNITS
Education (minimum units)	20-23
Education 110	4
At least one course from Education 120, 122, 123	4
Depth courses	12-15
At least 12-15 units from Education 114, 115, 116, 117A, 117B, 117C, 120, 122, 123, 130, 140, 151, 152, 163 chosen in consultation with an Education adviser.	

Minor Advisers. All faculty members with professorial titles.

Courses in Education

Upper Division Courses

100. Introduction to Teaching (3) I, II, III. Minnis, Crockenberg, Lowry
Lecture—1 hour; seminar—1 hour; field work—3 hours. Study of the classroom teacher's responsibilities and work place. Skills for observing classroom activities. Observing and tutoring in public schools.

110. Educational Psychology: General (4) I, II, III. Ehri, Figueroa, Sandoval, Sassenrath
Lecture—4 hours. Prerequisite: Psychology 1; upper division standing. Learning processes, intellectual development; individual differences and testing.

114. Quantitative Methods in Educational Research (4) II. Yonge
Lecture—4 hours. Prerequisite: two years of high school algebra. Problems and methods in data analysis. Design of research projects. Some considerations of procedures suited to digital computers.

115. Educating Handicapped Children (4) II. Figueroa
Lecture—4 hours. Prerequisite: upper division standing. Educational processes and skills required for teaching handicapped children who are integrated into regular classrooms.

116. Chicano Children: Psychological Issues (4) III. Figueroa
Lecture—4 hours. Prerequisite: course 110. Examination of psycho-educational literature on Chicano children within the framework of Erik Erikson's theories towards development of an assessment-intervention capability.

117A. Psychology of Reading (3) I, Ehri
Lecture—3 hours. Prerequisite: Psychology 1 or the equivalent and upper division standing. Application of verbal-learning and motivational principles to the design of a curriculum for the word-identification stage of beginning reading.

117B. Psychology of Reading (3) II. Ehri
Lecture—3 hours; discussion—1 hour. Prerequisite: Psychology 1 or the equivalent; upper division or graduate standing. Consideration of theory and research on the psychological structures and processes involved in achieving reading proficiency, with emphasis on comprehension and a psycholinguistic approach to reading.

***117C. Psychology of Reading** (2)
Seminar—2 hours. Prerequisite: Psychology 1 or the equivalent and upper division standing. An examination of selected research dealing with information-processing problems in poor readers, and related remedial instructional methods.

120. Philosophical and Social Foundations of Education (4) I, II, III. Arnstine, Black, Troutner
Lecture—4 hours. Prerequisite: upper division standing. Philosophical, historical, and sociological study of education and the school in our society.

***122. The Politics of the Schools** (4) I. Crockenberg
Discussion—4 hours. Prerequisite: upper division standing. The school as a social and political institution; the structure of school government, the role of teachers' organizations, the civil rights and responsibilities of teachers and students and the processes of institutional change.

123. John Dewey and the Foundations of Education (4) II. 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) II. Crockenberg, Arnstine, Milton (Mathematics)
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.

130L. Issues in Higher Education Laboratory (1-4) III. Arnstine, Crockenberg, Milton (Mathematics)
Discussion—1-2 hours; fieldwork-research—3-6 hours. Prerequisite: course 130 (with a passing grade) and consent of instructor. Individual and/or group research on a current issue in higher education. (P/NP grading only.)

140. Ivan Illich: Deschooling Society (4) III. Troutner
Lecture—2 hours; discussion—2 hours. Discussion and analysis of the ideas of Ivan Illich particularly on schooling, deschooling, medicine, and energy.

150. Educating and Tutoring Minority Children (3) II, III. Davis
Lecture—1 hour; discussion—1 hour; tutoring or work as teacher's aide in school—3 hours. Poverty, racism, and youth cultures as they affect a person's performance in school and how to deal with them in the school and community.

151. Language Development in the Chicano Child (3) II, 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-discussion—2 hours; field work—3 hours. Prerequisite: course 151; Spanish 101C. 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.

Education

(College of Letters and Science)

Julius M. Sassenrath, Ph.D., Chairperson of the
Department

David R. Wampler, Ph.D., Head of Teacher
Education

Department Office, 174 Kerr Hall

Faculty

Donald G. Arnstine, Ph.D., Professor
Helen G. Bacon, Ed.D., Lecturer in and
Supervisor of Teacher Education

Hugh C. Black, Ph.D., Professor
*Vincent A. Crockenberg, Ph.D., Associate
Professor

W. Augustus Davis, Ph.D., Lecturer in and
Supervisor of Teacher Education

Linnea C. Ehri, Ph.D., Associate Professor
Richard A. Figueroa, Ph.D., Assistant Professor

Jane Garritson, M.A., Lecturer in Teacher
Education

Maryann Gatheral, B.A., Lecturer in and
Supervisor of Teacher Education

Burt Liebert, M.F.A., Lecturer in and Supervisor
of Teacher Education

Jack E. Lowry, M.A.T., Lecturer in and
Supervisor of Teacher Education

163. Guidance and Counseling (4) I, II. Figueroa, Sandoval
Lecture—4 hours. Prerequisite: course 110 (may be taken concurrently). Nature and scope of pupil personnel services; basic tools and techniques of guidance; theory and practice of counseling psychology, with emphasis on educational and vocational adjustment.

164. Practicum and Seminar in Counseling (2) I, II.
Seminar—2 hours. Prerequisite: course 163 and consent of instructor. Practicum and seminar in counseling youth and adults. May be repeated twice for credit. (P/NP grading only.)

***180. Teaching in Learning Centers** (3) II. Turner
Lecture—1 hour; discussion—1 hour; fieldwork—3 hours. Methods and materials used by instructors in college learning centers, with particular emphasis on improving reading and study skills of college students.

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: upper division standing and consent of instructor. (P/NP grading only.)

Graduate Courses

200. Educational Research (2) II. Yonge
Lecture—1 hour; seminar—1 hour. Prerequisite: course 114 or the equivalent, or consent of instructor. A study of how to design, interpret, and conduct educational research.

203. Twentieth-Century Issues Over the Schools (4) I, Black
Lecture—2 hours; discussion—2 hours. A study of John Dewey and contrasting theories of education in relation to controversies over the aims, organization, curriculum and instructional practices in schools.

204. Existential Thought and Education (4) I, Troutner
Lecture—1 hour; discussion—1 hour; seminar—2 hours. A study and critical analysis of the implications of existential thought for education.

***205. The Concept of Mind in Teaching** (4) I, Arnstine
Seminar—4 hours. A philosophical analysis of the problems of educational practice which are created, aggravated, and sometimes solved by varying conceptualizations of mind and thinking.

207. Concepts of the Curriculum (3) II. Crockenberg
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Development of the skills of philosophical analysis in the examination of curriculum theory and practice, including the conceptual analyses of purposes, of the organization of subject matters, and the methods of instruction.

208. Education and the Law (3) II, Crockenberg
Seminar—3 hours. Prerequisite: graduate standing; course 122 recommended. An analysis of how selected areas of school law have developed, criticism of the present state of that law, and an understanding of needed legal reforms.

209. Pedagogics (4) III, Yonge, Troutner
Seminar—4 hours. A 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. Cognitive Learning** (3) I, Sassenrath
Lecture-discussion—3 hours. Prerequisite: consent of instructor. A critical analysis of selected problems and procedures in the study of cognitive learning processes.

211. Psychopedagogics (4) III. Yonge
Seminar—4 hours. Prerequisite: graduate standing or consent of instructor. A 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.

212. Language and Intellectual Development (4) I, Ehri
Seminar—4 hours. Prerequisite: consent of instructor. Theory and research on the development of language and thought in children; emergence of grammatical, semantic systems and operational thought; implications for education.

213. Individual Assessment (3) II. Sandoval
Lecture—3 hours. Prerequisite: courses 114 and 219, admission to school psychology program. Theories of intellectual functioning and the measurement of cognitive abilities in school-aged children. History and techniques of mental testing. Supervised practice in administration and scoring of contemporary tests including the WISC, the WAIS and the Stanford Binet with children.

***215. Motivation and Behavior Modification** (3)

Lecture—1½ hours; discussion—1½ hours. Prerequisite: course 110 or consent of instructor. Analysis of technologies for influencing behavior in educational settings, including theory and research on intrinsic and extrinsic motivation.

***218. Testing Minority Children** (4) III. 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.

219. Educational Testing and Evaluation (3) III. Sassenrath
Lecture-discussion—3 hours. Prerequisite: courses 114 and 200 or consent of instructor. A study of test theory as it applies to research and evaluation in education, with an emphasis on general ability and reading tests.

251. Research in Bilingual and Second Language Education (3) II. Merino

Discussion—1 hour; seminar—2 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 a bilingual/cross-cultural classroom; use of the vernacular in classroom.

252. Bilingual/Multi-Cultural Instructional Strategies and Curriculum (3) III. Merino

Seminar—2 hours; field work—3 hours. Prerequisite: proficiency in Spanish; courses 151, 152. Methods and techniques for developing, implementing and evaluating bilingual/multi-cultural curriculum content and instruction in elementary school. Topics include use of cross-cultural strategies in classroom; recent cross-cultural research on motivation and cognition; development of multi-media bilingual cross-cultural curriculum.

253. Language Arts in Bilingual Education (3) I, Merino

Seminar—2 hours; field work—3 hours. Prerequisite: course 151 or the equivalent; proficiency in Spanish. Analysis and development of language arts curriculum for bilingual/cross-cultural classroom. Topics include: language assessment; methods of teaching reading in Spanish; use of dialect varieties in the teaching of reading, and methods of teaching English and Spanish as a first and second language.

270A. Reading Diagnosis and Prescription (3) I, II. Gatheral
Lecture—2 hours; discussion—1 hour. Prerequisite: course 300 or the equivalent. The diagnosis and treatment of reading disabilities and the recognition of reading abilities. Analysis of clinical techniques, testing, use of material and teaching procedures.

***270B. Reading Instruction in Secondary Education** (3) II. Liebert
Lecture—1½ hours; discussion—1½ hours. Prerequisite: course 301 or the equivalent. Causal factors and diagnosis of reading disabilities. Principles of reading instruction in secondary education, including phonic, whole word, and other approaches.

270C. Research in Reading Instruction (3) III. Bacon
Seminar—3 hours. Prerequisite: course 270A or 270B or the equivalent. Examination of pertinent research in phonetic analysis, comprehension, testing, oral fluency, and dialect.

270D. Clinical Laboratory and Seminar in Reading Problems (5) Extra-session summer. Bacon, Gatheral
Seminar—2 hours; laboratory—9 hours. Prerequisite: consent of instructor. Development and application of diagnostic and prescriptive techniques in a reading clinic.

271. Recent Developments in Social Studies Education (3) III. Lowry

Lecture—2 hours; field work—2 hours. Prerequisite: consent of instructor. An analysis of the rationales, goals, objectives, and assumptions about learning and teaching strategies, and evaluation techniques in selected social studies curriculum projects.

272. Recent Developments in Science Education (3) II. Perkes

Lecture—3 hours. Prerequisite: consent of instructor. Analysis of contemporary science programs with special emphasis upon philosophical, psychological and pedagogical attributes of their design; trends, issues, and research in science curriculum and instruction.

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.

290. Seminar (2) I, II, III. The Staff (Chairperson in charge)
Seminar—2 hours. Prerequisite: graduate standing.

299. Research (1-6) I, II, III. The Staff (Chairperson in charge)
Individual research for graduate students. (S/U grading only.)

Professional Courses

300. Reading and Language Arts in the Elementary School (4) I, Bacon, Gatheral

Lecture—3 hours; field work—2 hours. Prerequisite: consent of instructor. Principles, procedures and curriculum materials for the teaching of reading and the oral and written language arts. Includes phonics and other developmental reading skills.

301. Reading in the Secondary School (4) I, III. Liebert
Discussion—4 hours. Prerequisite: must be teaching or student teaching. Principles, procedures, and materials to help secondary school teachers improve the reading competence of their students. The teaching of phonics, structural analysis, and alternative methods of coping with the problem reader in the classroom.

303. Art Education (3) III. Garritson

Lecture—1 hour; discussion—1 hour; 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 (Wampler in charge)

Lecture-discussion—3 hours; field work—15-30 hours; seminar—2 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 (Wampler in charge)

Lecture-discussion—3 hours; field work—15-30 hours; seminar—2 hours. Prerequisite: course 304A. 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 (Wampler in charge)

Lecture-discussion—3 hours; field work—15-30 hours; seminar—2 hours. Prerequisite: course 304B. 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 (Wampler in charge)

Lecture—3 hours; discussion—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 (Wampler in charge)

Lecture—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: course 305A. 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 (Wampler in charge)

Lecture—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: course 305B. 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

Lecture—1-2 hours; discussion—1 hour; 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 re-

Education Abroad Program

peated 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.

309. Early Childhood and Kindergarten Education (2) III. Skinner
Lecture—2 hours. Prerequisite: consent of instructor. Methods, materials, and history of nursery school and kindergarten education.

313. Secondary Art Methods (3) I. Garritson
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: open to students with Art major or secondary teaching specialty, or consent of instructor. Current readings and discussion of contemporary art and teaching. Formulation of curriculum and practice of techniques used in secondary schools. Observation and evaluation of several secondary school art programs.

322. Methods in Secondary Social Studies (3) I. Lowry
Lecture—2 hours; field work—3 hours. Prerequisite: acceptance into credential program with a social science major or minor. Recent developments in secondary social studies teaching strategies and curriculum materials with an emphasis on inquiry approaches.

323. Secondary School Curriculum: Science (3) I. Perkes
Lecture-discussion—2 hours; field work—3 hours. Conceptions of science curriculum and instruction. Scientific knowledge and methods as applied to course design and teaching; rationale and objectives of science programs; laboratory as an environment for learning. Lecture, laboratory, observation, and participation in public schools.

324. Teaching Methods in Mathematics (3) I. Ostergard
Lecture—3 hours. Prerequisite: admission to a teacher education program; simultaneous teaching experience; mathematics background or consent of instructor. Methods and curriculum for teaching mathematics at secondary level (grades 9-12); review of innovative mathematics programs in State.

351. Advanced Fieldwork in Bilingual Education: Teaching (3-5) I. The Staff
Seminar—2 hours; field work—3-9 hours. Prerequisite: admission to 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 (3-5) II. The Staff
Seminar—2 hours; field work—3-9 hours. Prerequisite: admission to Bilingual Education Specialist Program. Provides opportunity to acquire evaluation skills in the field under supervision of University staff and an experienced program evaluator. Topics and experiences will include preparation and evaluation of instruments, development and administration of diagnostic and placement instruments, program evaluation design.

***353. Advanced Fieldwork in Bilingual Education: Supervision (3-5) II, III.** The Staff
Seminar—2 hours; field work—3-9 hours. Prerequisite: admission to Bilingual Education Specialist Program. Provides opportunity to acquire supervisory skills under guidance of an experienced supervisor in bilingual/cross-cultural education. Topics and experiences include: analysis and use of the videotape and formal observation schedules in teacher supervision; local, national, and international resources for bilingual/cross-cultural materials; in-service training in bilingual/cross-cultural education.

361A-361B-361C. School Psychology: Introduction (2-2-2) I-II-III. Sandoval and Staff
Seminar—2 hours; field work—½ school day per week. Prerequisite: admission to school psychology credential program. School applications of learning and developmental theory, institutional organizational theory, psychological theory and curriculum development, psychology of exceptional children in the school. Field work in the school and other institutions serving children. (S/U grading only.)

362A-362B-362C. School Psychology: Advanced (2-2-2) I-II-III. Sandoval, Figueroa
Seminar—2 hours; field work—½ school day per week. Prerequisite: course 361C and admission to school psychology credential program. Theories and techniques in school-based consultation, advanced individual and group counseling, crisis counseling, educational program evaluation, legal issues in school psychology. (S/U grading only.)

363. School Psychology: Internship (4-8) I, II, III. Sandoval, Figueroa
Seminar—2 hours; internship—6-18 hours per week. Prerequisite: admission to school psychology credential program. 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.)

370A. Advanced Fieldwork in Reading: Elementary (2) I. Bacon, Gatheral
Fieldwork plus conference with supervisor—4 hours. Prerequisite: acceptance into reading credential program. Supervised advanced practice in reading instruction in an elementary school. Emphasis on development and use of diagnostic-prescriptive techniques. (S/U grading only.)

370B. Advanced Fieldwork in Reading: Secondary (2) III. Liebert
Fieldwork plus conference with supervisor—4 hours. Prerequisite: acceptance into reading credential program. Advanced study of methods and materials in secondary reading instruction, including experience in diagnosis, prescription, remediation, and evaluation in a reading laboratory. (S/U grading only.)

370C. Fieldwork in Reading Supervision (2) II. Bacon, Gatheral, Liebert
Fieldwork plus conference with supervisor—4 hours. Prerequisite: acceptance into reading credential program. Field experience in developing and supervising reading programs. Planning and implementing teacher in-service education at school and district levels. (S/U grading only.)

Education Abroad Program

Hendrik J. Ketellapper, Ph.D., Campus Coordinator
Campus Coordinator's Office, 150 Mrak Hall (752-0392)

Program Office, 323 South Hall (752-3014)

Programs of Study

The Education Abroad Program (EAP) of the University of California offers upper division students who meet the minimal admission requirements (see page 20) 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 students, 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.

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 graduate students as well. Students considering study abroad with the EAP should contact the EAP Office or the Coordinator's 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.

Application forms are available from the EAP Office. A provisional academic planning form, prepared in consultation with the coordinator or academic counselor 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.

Students who do not meet the minimal requirements for acceptance (page 20) must consult the Campus Coordinator. Students who will have accumulated more than 145 units prior to the be-

ginning of their planned year of study abroad must also consult the Campus Coordinator before submitting an application; the probability of such students' being accepted is rather low.

Selection

The Academic Senate Committee on the Education Abroad Program has the final authority to decide which applicants will be nominated as candidates for EAP participation by 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 and the Office of the Coordinator.

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, 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 University Office of the EAP on the Santa Barbara campus, where final selection decisions will be made.

Academic Program

In most cases, the students from the University of California live as the students of the host country do and 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 has 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 United Kingdom, Ireland, Egypt, Ghana, and Kenya); (2) a full year of academic courses; (3) broad opportunity to audit courses 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. Lower unit minima may be set for centers with an exceptionally short academic year.

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 (page 62). 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. The applicant's College or School Dean is the source for information on the University residence requirement and additional residence requirements imposed by the College.

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 academic counselor in the Coordinator's Office.

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 at Georg-August University in Goettingen, Germany, precedes the beginning of the academic year. All courses are taught in German.

University of Vienna. Eastern European studies (Balkans, Soviet Union), fine arts (history of art, music, theatre arts), folklore, history. (This is a cooperative program with Stanford University.)

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, Grenoble, and Paris.

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; mathematics and computer science. Offerings in anthropology, psychology, and history are severely limited. Not suitable for life and physical sciences.

University of Marseilles. Biological sciences and environmental marine biology. The Marseilles program is open only to students in the biological sciences. Students who have completed only one year of French are eligible for participation, but they

must take part in the two-month summer Intensive Scientific French program at the University of Montpellier.

University of Montpellier. Humanities and literature, primarily through Paul Valéry University.

University of Paris. Film studies and some theatre studies. Graduate programs in history and literature.

Pau-Paris. The participants spend the first semester at the University of Pau and then, at the end of January, move to Paris to study at the University of the New Sorbonne (Paris III). In addition to required core courses in French civilization, students are able to take courses in humanities and social sciences, with emphasis on comparative cultural studies, French civilization and language.

University of Poitiers. Humanities, with major emphasis in history and medieval studies; mathematics; physics.

Germany. A compulsory intensive language program precedes the beginning of the academic year. All courses are taught in German.

Georg-August University, Goettingen. 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.

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 are eligible for participation in the EAP in Italy, but they must take part in a special two-month summer language program at the University of Perugia, 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.

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.

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 must be submitted for admission.

Cini Foundation, Venice. Independent study projects for graduate students in art history.

Norway. Knowledge of Norwegian is not required, but a compulsory intensive course in Norwegian (mid-June to mid-August) precedes the beginning of the academic year. Intensive language study is continued during the fall semester. All courses are taught in Norwegian.

University of Bergen. Humanities, social sciences, natural sciences, and mathematics are available, but space in the sciences may be limited. The usual pattern is study of a single subject, usually the major or a closely allied field, for the entire year.

Spain. A compulsory intensive language program precedes the beginning of the academic year. All instruction is in Spanish.

University of Barcelona. Humanities (with emphasis on Spanish art, history, literature, linguistics) and some social sciences. A study program consists entirely of core courses developed for the Center and taught by the University of Barcelona. (This is a cooperative program with the University of Illinois.)

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 one regular year-long course in the 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.

University of Lund. Broad curriculum. Excellent science programs.

United Kingdom and Ireland. The program, which includes 14 institutions, is administered by a director and associate director located in London. The UK program is highly competitive, largely due to its popularity with students. After a student has been selected for participation by the EAP administration, he or she 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 Exeter, University of Kent, University of Leeds, University of Sussex, Westfield College (University of London).* Occasionally, students may be placed on an *ad hoc* basis at such institutions as University of Bath, London School of Economics, Oxford University, Polytechnic of Central London, University of Warwick, Wimbledon School of Art (London).

Ireland: *Trinity College of the University of Dublin.*

Scotland: *University of Edinburgh, 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. Polytechnic of Central London is open to students in architecture; and Wimbledon offers art studio, art history, and three-dimensional design, including theatre design.

USSR. The Russian program is a one-semester program organized by a consortium of American universities. Three years of Russian at the university level is a firm prerequisite. The program is primarily intended for language majors, but it is open to students of literature, history, area studies, etc.

Leningrad State University. Russian language and civilization only.

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 language course precedes the beginning of the academic year. Study centers in Israel are administered by a UC faculty director located in Jerusalem.

University of Haifa. Humanities and social sciences, with special emphasis on contemporary Israel and Arab-Jewish studies. Limited opportunities in the sciences. Special program in Underwater Archaeology. Courses are taught in Hebrew. The Department of Study Programs for Overseas Students offers a core curriculum in Jewish, Middle East and Israeli studies, social sciences, and history of modern Israel in English.

Hebrew University, Jerusalem. Broad curriculum; emphasis on Israel and Middle Eastern studies. UC students enroll in a special program for foreign

NOTE: For key to footnote symbols, see page 130.

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. In addition, the School for Overseas Students in cooperation with the mathematics and science faculty offers an extensive one-year program in the sciences based mainly on laboratory courses. Students with command of Hebrew have access to a broad curriculum throughout the Hebrew University.

Far East

Hong Kong. A limited selection of courses is offered in English. Knowledge of Chinese is not required for acceptance, but all students are required to include 18 units of Mandarin or Cantonese in their annual program. A compulsory intensive Cantonese program precedes the beginning of the academic year.

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.)

Japan. Completion of one year of Japanese at the university level or the equivalent is required for acceptance. (A compulsory intensive language course precedes the academic year.) Students are expected to complete an additional 18 units of Japanese language during their year in Japan. A limited number of courses taught in English is available.

International Christian University, Mitaka (Tokyo). Humanities and social sciences; emphasis on Japanese language and problems of the Orient.

University of Tsukuba. Open to graduate students only. Admission requires completion of at least two years of college-level Japanese. Major fields of graduate study are available; most UC students will be accepted in the Area Studies program.

Africa

Kenya. Open to undergraduate and graduate students. As in the British system, students take a year-long program of study in their major or area of specialization. Examinations are given once, at the end of the academic year, and are mandatory for receiving credit.

University of Nairobi. Humanities and social sciences, with emphasis in African studies. Limited opportunities in the sciences and in veterinary science. Graduate students in history, political science, sociology, architecture, and design may associate with the Institute for Developmental Studies, Institute for African Studies, or the Housing and Research Development Unit.

West Africa. The West-African Study Center includes three universities in three different countries: The University of Ghana (Ghana), Fourah Bay College (Sierra Leone), and the University of Benin (Togo). A UC faculty director is in residence at the University of Ghana. Tentative plans are to open this Center for the 1980-81 academic year. The center is intended primarily for students with interests in various aspects of African studies.

University of Ghana, Legon-Accra, Ghana. Open to undergraduate and graduate students. 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, and some science. Emphasis is on African studies. There is a strong program in ethnomusicology.

Fourah Bay College, Freetown, Sierra Leone. Fourah Bay College is a constituent college of the

Federal University of Sierra Leone. Since the College follows the British system, students will take a program of year-long courses in a single area. End-of-year examinations are given only once and are mandatory for receiving credit. Extensive course offerings on Africa-related topics, social sciences, the arts, and some science and engineering are available. There is an Institute of African Studies and an Institute of Marine Biology and Oceanography.

University of Benin, Lome, Togo. The University of Benin follows the French system. Two years or the equivalent of college-level French are required and participants must attend a compulsory intensive language program with the EAP in France prior to the beginning of the academic year.

The School of Letters offers programs in African literature, history, geography, philosophy, and applied social sciences, all with emphasis on Africa.

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.

University of São Paulo. Brazilian literature, Portuguese language, arts, humanities, social sciences. (This is a cooperative program with the University of Indiana.)

Mexico. A compulsory intensive language program precedes the beginning of the academic year. Students usually enroll in courses offered by the School for Foreign Students. Those who are qualified have access to the full curricular offerings of the host university.

Universidad Nacional Autonoma de Mexico (UNAM), Mexico City. Humanities, social sciences, art practice. The School for Foreign Students offers Latin American art, literature, and history; Mexican and Central American studies; and Spanish language and literature.

Peru. A compulsory intensive language course precedes the beginning of the academic year. All courses are taught in Spanish.

Universidad Catolica, Lima. Humanities, social sciences. Anthropology, archaeology, and ethnohistory are of special interest. (This is a program of the Peru Consortium, which is composed of the University of Indiana and a number of California universities.)

Engineering

(College of Engineering)

John D. Kemper, Ph.D., Dean of the College
Roy Bainer, M.S., LL.D., Dean Emeritus of the College

Don O. Brush, Ph.D., Associate Dean—Undergraduate Study
Zahair A. Munir, Ph.D., Associate Dean—Graduate Study

Ray B. Krone, Ph.D., Associate Dean—Research
College Office, 2132 Bainer Hall

Faculty

Worden Waring, Ph.D., Professor (School of Medicine)

The Major Programs

Eighteen undergraduate engineering curricula, including six formal double-major programs, are offered. Each of these is a four-year program leading to the degree of Bachelor of Science. The Agricultural, Chemical, Civil, Electrical and Computer, and Mechanical Engineering curricula are five programs which have been accredited by the Engineers' Council for Professional Development, the nationally recognized accrediting body for engineering curricula.

Major Advisers. For adviser assignment or change of adviser, contact the College Undergraduate Office.

Graduate Study. See pages 87 and 99. For additional information refer to the *College of Engineering Bulletin*, obtainable from the College Undergraduate Office.

B.S. Major Requirements:

Except for the individual major, the four-year undergraduate program is divided into two parts, namely the appropriate Lower Division Program and the Upper Division Program of your choice.

Curricula

See pages 79-87 for general descriptions of the majors in engineering and for lists of suggested technical electives; and page 77 for lists of acceptable Basic Science and Mathematics electives and acceptable Humanities-Social Sciences electives.

Students who enter the College of Engineering with fewer than 84 quarter units of credit follow one of the two common Lower Division Programs outlined below. One program is for students who plan to major in either Chemical Engineering or the double major, Chemical Engineering and Materials Science and Engineering. The other program is for students planning study in the other Engineering majors. The Lower Division Program for students who enter the College of Engineering with 84 or more quarter units of credits is listed under "Admission to Advanced Standing" on page 74.

Engineering — Lower Division Program

Requirements common to all Engineering majors except Chemical Engineering and the double major, Chemical Engineering/Materials Science and Engineering.

	UNITS	QUARTER USUALLY TAKEN
Required Courses		
Calculus—Mathematics		
21A-21B-21C	12	1-2-3
Differential equations—		
Mathematics 22B	3	5
Vector analysis—Mathematics		
22C	3	4
General physics—Physics		
8A-8B-8C-8D	16	3-4-5-6
General chemistry—		
Chemistry 1A-1B- or 4A-4B ...	10	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
(Majors in Electrical and Computer Engineering and in Electrical and Computer Engineering/Materials Science and Engineering may substitute 3 units of unrestricted electives for Engineering 4.)		

Applications of computers— Engineering 5	3	2 or 3
Circuits—Engineering 17	3	5 or 6
Statics—Engineering 35	3	4 or 5
Properties of materials Engineering 45	4	4 or 6
Expository writing—English 1, Comparative Literature 1, 2, or 3 ..	4	1 or 2
Introduction to public speaking or group communication— Rhetoric 1 or 3	4	
Humanities-social sciences electives	8	
Basic science and mathematics electives	8	
Unrestricted electives	3	
(Civil Engineering majors and Agricultural Engineering — Forest Engineering option majors take Civil Engineering 10 in place of 3 units of unrestricted electives).		
Total Units	90	

Chemical Engineering — Lower Division Program

Requirements for major in Chemical Engineering and the double major, Chemical Engineering/Materials Science and Engineering only.

	UNITS	QUARTER USUALLY TAKEN
Required Courses		
Calculus—Mathematics 21A-21B-21C	12	1-2-3
Linear algebra—Mathematics 22A	3	6
Differential equations — Mathematics 22B	3	5
Vector analysis—Mathematics 22C	3	4
General Physics—Physics 8A-8B-8C-8D	16	3-4-5-6
General Chemistry—Chemistry 4A-4B-4C	15	1-2-3
Organic Chemistry—Chemistry 128A, 128B	6	4-5
Organic Chemistry laboratory— Chemistry 129A	2	6
Introduction to engineering systems or properties of materials Engineering 3 or 45	3 or 4	1 or 4
(Chemical Engineering majors take Engineering 3; Chemical Engineering/Materials Science and Engineering majors take Engineering 45. Engineering 3 is designed for freshman students. More advanced Chemical Engineering students may petition to substitute Engineering 45 or 3 units of technical electives for Engineering 3.)		
Engineering applications of computers—Engineering 5	3	2 or 5
Circuits—Engineering 17	3	5
Statics—Engineering 35	3	4
Expository writing—English 1, Comparative Literature 1, 2, or 3	4	2 or 3
Introduction to public speaking or group communication— Rhetoric 1 or 3	4	
Humanities-social sciences electives	11	
Total Units	91 or 92	

Aeronautical Engineering

Minimum units required: 180.

Upper Division Program

	UNITS
Subject Areas and Courses	
Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 102B, 104A, 104B	12
Fluid mechanics—Engineering 103A, 103B; Mechanical Engineering 110	9
Applied thermodynamics—Engineering 105A, 105B; Mechanical Engineering 165	9
Vehicle aerodynamics—Mechanical Engineering 127	3
Controls and systems analysis—Mechanical Engineering 171	4
Structures—Civil Engineering 135	3
Vehicle stability—Mechanical Engineering 134	4

NOTE: For key to footnote symbols, see page 130.

Vehicle design— Mechanical Engineering 128A, 128B	4
Measurements and laboratory—Engineering 102L, 103L, 105L; Mechanical Engineering 176	6
Applied mathematics—Engineering 180	3
Technical electives	14
Choose at least 9 of the 14 units from Mechanical Engineering 150A, 161, 162, 163, 172; Engineering 106, 148, 190; Civil Engineering 131B; Electrical and Computer Engineering 150. One course must be chosen from Mechanical Engineering 124, 150B, 152, 155, 172.	
Humanities-social sciences electives	15
Total Units	90

Agricultural Engineering

(Except Forest Engineering Option)

(Accredited by Engineers' Council for Professional Development)

Minimum units required: 180.

Upper Division Program

	UNITS
Subject Areas and Courses	
Applied mechanics and thermodynamics— Engineering 102A, 103A, 104A, 105A, and two courses from Engineering 102B, 103B (or Civil Engineering 141), 104B, 105B	18
Electronic circuits—Engineering 100	4
Design—Agricultural Engineering 150 plus one of the following courses: Civil Engineering 132A or 145 or Mechanical Engineering 150A	5
Engineering economics—Engineering 106	3
Professional responsibilities—Engineering 190	3
Mathematics elective	3
Select from Applied Science 115; Engineering 118, 180; Mathematics 22A, 128A; Statistics 32, 130A	
Agricultural engineering electives	12
Select from the following: a. Agricultural Engineering 112, 114; b. Agricultural Engineering 125; c. Agricultural Engineering 133, 134; d. Water Science 110B, 160. Must include one course from each of three of the four groups.	
Agricultural and biological sciences electives	6
Select from Agronomy 100; Animal Science 2; Bacteriology 2; Biochemistry and Biophysics 101A, 101B; Biological Sciences 1; Botany 2; Entomology 112; Nutrition 103; Physiology 100A, 100B, 149; Plant Pathology 120; Plant Science 2, 112; Soil Science 2, 109, 122, 150; Vegetable Crops 100, 101; Water Science 103; Wildlife and Fisheries Biology 120. Must include one upper division course.	
Technical electives	17
At least 18 units must be selected from upper division engineering courses.	
Humanities-social sciences electives	15
Unrestricted elective	4
Total Units	90

Agricultural Engineering (Forest Engineering Option)

Minimum units required: 195.

Upper Division Program

	UNITS
Subject Areas and Courses	
Applied mechanics—Engineering 102A, 103A, 104A (or Mechanical Engineering 104A and Civil Engineering 165A, 130A, respectively, Berkeley campus)	9
Applied thermodynamics—Engineering 105A (or Mechanical Engineering 105A, Berkeley campus)	3
Electronic circuits—Engineering 100	4
Design—Agricultural Engineering 150 plus one of the following courses: Civil Engineering 132A or 145 or Mechanical Engineering 150A	5
Engineering economics—Engineering 106	3
Professional responsibilities—Engineering 190	3

Forestry summer field study—Forestry 100A, 100B, 100C (offered by Berkeley campus)	15
Forest engineering—Forestry 103 (Berkeley campus), Agricultural Engineering 115	6
Forestry—Forestry 113, 125 (Berkeley campus)	9
Mathematics elective	3
Select from Applied Science 115; Engineering 118, 180; Mathematics 22A, 128A; Statistics 32, 130A.	
Forestry electives	12
Select from Forestry 101, 102, 110A, 110B, 114, 120, 122; Wood Science and Technology 131, 132, 133, 134 (Berkeley campus).	
Engineering electives	8
Select from Agricultural Engineering 112, 116, 117, 118, 119; Civil Engineering 171; Engineering 102B, 103B, 104B, 111, 122, 140; Mechanical Engineering 150B, 152, 155.	
Technical electives	6
Must be selected from engineering courses.	
Humanities-social sciences electives	15
Unrestricted elective	4
Total Units	105

**Agricultural Engineering/
Materials Science and
Engineering**

Minimum units required: 180.

Upper Division Program

	UNITS
Subject Areas and Courses	
Applied mechanics—Engineering 102A, 103A, 104A, 104B; Engineering 102B or 103B or Civil Engineering 141	15
Applied thermodynamics—Engineering 105A, 130	7
Electronic circuits—Engineering 100	4
Design—Agricultural Engineering 150 plus one of the following courses: Civil Engineering 132A or 145 or Mechanical Engineering 150A	5
Engineering economics—Engineering 106	3
Materials science—Engineering 132, 134, 148; and one course from Engineering 140, 142, 144, 146	14
Applied mathematics—Engineering 180	3
Professional responsibilities—Engineering 190	3
Agricultural engineering electives	12
Select from the following: a. Agricultural Engineering 112, 114; b. Agricultural Engineering 125; c. Agricultural Engineering 133, 134; d. Water Science 110B, 160. Must include one course from each of three of the four groups.	
Agricultural and biological sciences electives	6
Select from Agronomy 100; Animal Science 2; Bacteriology 2; Biochemistry and Biophysics 101A, 101B; Biological Sciences 1; Botany 2; Entomology 112; Nutrition 103; Physiology 100A, 100B, 149; Plant Pathology 120; Plant Science 2, 112; Soil Science 2, 109, 122, 150; Vegetable Crops 100, 101; Water Science 103; Wildlife and Fisheries Biology 120. Must include one upper division course.	
Humanities-social sciences electives	15
Unrestricted electives	3
Total Units	90

Chemical Engineering

(Accredited by Engineers' Council for Professional Development)

Minimum units required: 187.

Upper Division Program

	UNITS
Subject Areas and Courses	
Engineering—Engineering 100, 102A	7
Chemical Engineering—Chemical Engineering 150A, 150B, 151, 152A, 152B, 153, 154A, 154B, 155A, 155B, 156A, 156B, 157, 158	46

Engineering

Chemistry—Chemistry 110A, 110B, 110C	9
Technical electives	22
Humanities—social sciences electives	12
Total Units	96

Chemical Engineering/Materials Science and Engineering

Minimum units required: 191.

Upper Division Program

Subject Areas and Courses	UNITS
Engineering—Engineering 100, 102A	7
Chemical engineering—Chemical Engineering 150A, 150B, 151, 152A, 152B, 153, 154A, 154B, 155A, 155B, 156A, 156B, 157, 158	46
Chemistry—Chemistry 110A, 110B, 110C	9
Materials science—Engineering 130, 132, 134, 148 and three courses from Engineering 140, 142, 144, 146	25
Humanities-social sciences electives	12
Total Units	99

Civil Engineering

(Accredited by Engineers' Council for Professional Development)

Minimum units required: 180.

Upper Division Program

Subject Areas and Courses	UNITS
Electronic circuits—Engineering 100 or 111	3†
Applied mechanics—Engineering 102A, 103A, 104A	9
Applied thermodynamics—Engineering 105A or Chemistry 110A	3
Structures—Engineering 104B; Civil Engineering 131A	6
Soil mechanics—Civil Engineering 171, 172	5
Hydraulics and water resources—Civil Engineering 141, 141L, 142, 148A	10
Civil engineering design—Civil Engineering 132B plus any two courses from Civil Engineering 132A, 132C, 134, 139, 144, 145, 146, 148B, 152, 173	9
Economics—Engineering 106	3
Transportation electives—select from Civil Engineering 160, 161, or 162 (Civil Engineering 10 required prior to taking these courses)	3
Mathematics electives—select from Mathematics 22A, 128A, 128B, 128C; Statistics 130A, 130B, 131A, 131B; Applied Science 115; Engineering 118, 180; Civil Engineering 153	5
Technical electives, 9 of these units must be selected from engineering courses	19†
Humanities-social sciences electives	15
Total Units	90

Civil Engineering/Materials Science and Engineering

Minimum units required: 180.

Upper Division Program

Subject Areas and Courses	UNITS
Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 103A, 104A	9
Applied thermodynamics—Engineering 105A or Chemistry 110A; Engineering 130	7
Structures—Engineering 104B; Civil Engineering 131A	6
Soil mechanics—Civil Engineering 171, 172	5
Hydraulics and water resources—Civil Engineering 141, 141L, 142, 148A	10

†One unit of Engineering 100 will be applied toward the Technical electives.

Civil engineering design—Civil Engineering 132B, plus any two courses from Civil Engineering 132A, 132C, 134, 139, 144, 145, 146, 148B, 152, 162, 173	9
Economics—Engineering 106	3
Mathematics electives—select from Mathematics 22A, 128A, 128B, 128C; Statistics 130A, 130B, 131A, 131B; Applied Science 115; Engineering 118, 180; Civil Engineering 153	5
Materials science electives—choose four courses from Engineering 140, 142, 144, 146, 148	14
Technical elective	3
Humanities-social sciences electives	15
Civil Engineering 137 recommended.	
Total Units	90

Electrical and Computer Engineering

(Accredited by Engineers' Council for Professional Development)

Minimum units required: 180.

Upper Division Program

Subject Areas and Courses	UNITS
Mathematics—Mathematics 22A (if this course is taken to satisfy the Basic Science and Mathematics requirement, substitute any mathematics course with a number higher than 20, except 101)	3
Professional responsibilities—Engineering 190	3
Engineering science—Engineering 102A, 105A	6
Circuits, systems and electronics—Engineering 100, Electrical and Computer Engineering 110, 111, 112	15
Computers—Electrical and Computer Engineering 170	4
Electromagnetic fields and physical electronics—Electrical and Computer Engineering 130A, 130B, 140	10
Laboratory elective—one upper division Electrical and Computer Engineering course with laboratory (except Engineering 100, Electrical and Computer Engineering 111; but may include Electrical and Computer Engineering 199)	3
Design technical electives—select four courses from Electrical and Computer Engineering 114A, 114B, 115A, 115B, 131C, 132A, 132B, 145A, 145B, 145C, 150, 151, 157A, 157B, 160, 161, 165, 171, 175, 176, 180, 181, 182	12
Additional technical electives	18
Humanities-social sciences electives	15
Unrestricted elective	1
Total Units	90

Electrical and Computer Engineering: Computers

(Accredited by Engineers' Council for Professional Development under Electrical Engineering)

Minimum units required: 180.

Upper Division Program

Subject Areas and Courses	UNITS
Mathematics—Mathematics 22A (if taken to satisfy the Basic Science and Mathematics requirement substitute any mathematics course with a number higher than 20 except 101)	3
Professional responsibilities—Engineering 190	3
Engineering sciences—Engineering 102A, 105A	6
Circuits, systems, and electronics—Engineering 100, Electrical and Computer Engineering 110, 111, 112	15
Computers (design)—Electrical and Computer Engineering 170, 171, 180	12
Electromagnetic fields and physical electronics—Electrical and Computer Engineering 130A, 130B, 140	10

Laboratory elective—one upper division Electrical and Computer Engineering course with laboratory (except Engineering 100. Electrical and Computer Engineering 111; but may include Electrical and Computer Engineering 199)	3
Computers electives—select three courses from Electrical and Computer Engineering 151, 175, 176, 181, 182, 271, 277, Community Health 151, 252	9
Additional technical electives	12
Humanities-social sciences electives	15
Unrestricted elective	2
Total Units	90

Electrical and Computer Engineering: Electronics, Circuits and Signal Processing

(Accredited by Engineers' Council for Professional Development under Electrical Engineering)

Minimum units required: 180.

Upper Division Program

Subject Areas and Courses	UNITS
Mathematics—Mathematics 22A (if taken to satisfy the Basic Science and Mathematics requirement, substitute any mathematics course with a number higher than 20, except 101)	3
Professional responsibilities—Engineering 190	3
Engineering science—Engineering 102A, 105A	6
Circuits, systems and electronics—Engineering 100, Electrical and Computer Engineering 110, 111, 112, 151, 160	21
Computers—Electrical and Computer Engineering 170	4
Electromagnetic fields and physical electronics—Electrical and Computer Engineering 130A, 130B, 140	10
Laboratory elective—one upper division Electrical and Computer Engineering course with laboratory (except Engineering 100. Electrical and Computer Engineering 111; but may include Electrical and Computer Engineering 199)	3
Electronics circuits and signal processing (design) electives—select three courses from Electrical and Computer Engineering 114A, 114B, 150, 157A, 157B, 161, 165, 176	9
Additional technical electives	15
Humanities-social sciences electives	15
Unrestricted electives	1
Total Units	90

Electrical and Computer Engineering: Solid State, Microwaves and Quantum Electronics

(Accredited by Engineers' Council for Professional Development under Electrical Engineering)

Minimum units required: 180.

Upper Division Program

Subject Areas and Courses	UNITS
Mathematics—Mathematics 22A (if taken to satisfy the Basic Science and Mathematics requirement, substitute any mathematics course with a number higher than 20, except 101)	3
Professional responsibilities—Engineering 190	3
Engineering science—Engineering 102A, 105A	6
Circuits, systems and electronics—Engineering 100, Electrical and Computer Engineering 110, 111, 112,	15
Computers—Electrical and Computer Engineering 170	4
Solid state, microwaves and quantum electronics—Electrical and Computer Engineering 130A, 130B, 131A, 140, 145A	16

Laboratory elective—select from Electrical and Computer Engineering 114A, 114B, 115A, 115B, 133	3
Solid-state microwaves and quantum electronics (design) electives—select four courses from Electrical and Computer Engineering 114A, 114B, 115A, 115B, 132A, 132B, 145B, 145C, 175	12
Additional technical electives (may include courses not used for solid-state, microwaves and quantum electronics (design) electives listed above)	12
Humanities-social sciences electives	15
Unrestricted electives	1
Total Units	90

Electrical and Computer Engineering: Materials Science and Engineering

Minimum units required: 180.

Upper Division Program

Subject Areas and Courses

Mathematics—Mathematics 22A (if taken to satisfy the Basic Science and Mathematics requirement, substitute any mathematics course with a number higher than 20, except 101)	3
Professional responsibilities—Engineering 190	3
Engineering science—Engineering 102A, 105A, 130	10
Laboratory elective—Electrical and Computer Engineering courses with a total of 2 units of laboratory in physical electronics area	2
Circuits, systems and electronics—Engineering 100, Electrical and Computer Engineering 110, 111, 112	15
Computers—Electrical and Computer Engineering 170	4
Electromagnetic fields and physical electronics—Electrical and Computer Engineering 130A, 130B, 140	10
Solid-state electronics—Electrical and Computer Engineering 145A, 145B, 145A	9
Materials science—Engineering 142, 148, and two courses chosen from Engineering 140, 144, 146	14
Technical electives	5
Humanities—social sciences electives	15
Total Units	90

Materials Science and Engineering

Minimum units required: 180.

Upper Division Program

Subject Areas and Courses

Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 104A	6
Fluid mechanics—Engineering 103A	3
Applied thermodynamics—Engineering 105A, 130	7
Materials in design—Engineering 140	4
Measurements and laboratory—Engineering 146; Mechanical Engineering 124, 176	8
Materials science—Engineering 132, 134, 142, 144, 148	18
Applied mathematics—Engineering 180	3
Technical electives	22
Humanities—social sciences elective	15
Total Units	90

Mechanical Engineering

(Accredited by Engineers' Council for Professional Development)

Minimum units required: 180.

Upper Division Program

Subject Areas and Courses

Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 102B, 104A, 104B	12
Applied thermodynamics—Engineering 105A, 105B; Mechanical Engineering 165	9
Fluid mechanics—Engineering 103A, 103B	6
Mechanical design—Mechanical Engineering 150A	4
Controls and systems analysis—Mechanical Engineering 171	4
Measurements and laboratory—Engineering 102L, 103L, 105L, Mechanical Engineering 176	6
Professional responsibilities—Engineering 190	3
Applied mathematics—Engineering 180	3
Technical electives	24
Choose 12 of the 24 units from upper division Engineering or Mechanical Engineering courses. Two courses must be chosen from Mechanical Engineering 124, 128A, 128B, 134, 150B, 152, 155, 172.	
Humanities—social sciences electives	15
Total Units	90

Mechanical Engineering/Aeronautical Engineering

Minimum units required: 180.

Upper Division Program

Subject Areas and Courses

Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 102B, 104A, 104B	12
Applied thermodynamics—Engineering 105A, 105B; Mechanical Engineering 165	9
Fluid mechanics—Engineering 103A, 103B, Mechanical Engineering 110	9
Mechanical design—Mechanical Engineering 150A	4
Controls and systems analysis—Mechanical Engineering 171	4
Vehicle aerodynamics—Mechanical Engineering 127	3
Structures—Civil Engineering 135	3
Vehicle design—Mechanical Engineering 128A, 128B	4
Measurements and laboratory—Engineering 102L, 103L, 105L, Mechanical Engineering 176	6
Applied mathematics—Engineering 180	3
Technical electives	14
Two courses must be chosen from Mechanical Engineering 124, 134, 150B, 152, 155, 172.	
Humanities-social sciences electives	15
Total Units	90

Mechanical Engineering/Materials Science and Engineering

Minimum units required: 180.

Upper Division Program

Subject Areas and Courses

Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 102B, 104A, 104B	12
Applied thermodynamics—Engineering 105A, 105B, 130; Mechanical Engineering 165	13
Fluid mechanics—Engineering 103A, 103B	6
Mechanical design—Engineering 140, Mechanical Engineering 150A	8
Controls and systems analysis—Mechanical Engineering 171	4
Materials science—Engineering 132, 134, 148	11
Measurements and laboratory—Engineering 102L, 103L, 105L, Mechanical Engineering 176	6

Applied mathematics—Engineering 180	3
Professional responsibilities—Engineering 190	3
Technical electives	4
Two courses must be chosen from Mechanical Engineering 124, 128A, 128B, 134, 150B, 152, 155, 172 (Mechanical Engineering 124 is strongly recommended.)	
Humanities-social sciences electives	15
Unrestricted elective	1
Total Units	90

Individual (Engineering) Major

Minimum units required: 180.

An engineering student who has a definite career objective that is not compatible with one of the named curricula may propose an Individual engineering major. (See page 231.)

Courses in Engineering

Lower Division Courses

1. Plane Surveying (3) III. Goss

Lecture—2 hours; laboratory—3 hours. Prerequisite: plane trigonometry; Consumer Technology 31 recommended. Not open to students in Engineering. Principles of measurement of horizontal distances, horizontal and vertical angles, elevations and differential levels, including stadia methods. Field problems with special reference to agricultural, forestry and landscaping applications.

3. Introduction to Engineering Systems (3) I, II, III Tchobanoglous

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 21A recommended (may be taken concurrently). An introduction to the engineering profession. A 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. The Staff (Beadle in charge)

Lecture—2 hours; laboratory—3 hours. Principles of descriptive geometry and of mechanical and free-hand drawing; their application in the representation, visualization, and solution of engineering problems. Computer-aided graphics. Introduction to engineering design.

5. Applications of Computers (3) II, III. The Staff (Algazi in charge)

Discussion—1 hour; lecture—2 hours. Prerequisite: Mathematics 16A or 21A. Introduction to digital computation and computer programming. Algorithms and their description. Basic programming; debugging of programs. Problems in approximate computing accuracy and significance. Practice with an algebraic language (FORTRAN) in solving simple numerical and nonnumerical problems. Students having had Mathematics 29 may not receive credit for this course, and those having had Mathematics 19 may receive only two units of credit.

10. Technology and Society (3) I. The Staff (Romstad in charge)

Lecture—2 hours; discussion—1 hour. Types of technology: communication, computation, defense technology, information development, and transportation. World energy resources and society's energy needs. Effects of technology on society: population control, personality development, technology and the economy. (P/NP grading only.)

*15. Computers and People (3) I, Dorf

Lecture—2 hours; discussion—1 hour. Prerequisite: high school algebra. An introduction to computers for those not majoring in Engineering. The applications of computers in society. History, nature and use in business, education, government and the arts. Cybernetics, artificial intelligence and the social consequences of computers. BASIC programming.

17. Circuits (3) I, II, III. The Staff (Algazi in charge)

Lecture—3 hours. Prerequisite: Mathematics 22B (may be taken concurrently); Physics 8B; enrollment open to Engineering students only. Basic circuit analysis techniques; transient and steady-state solutions using differential equations.

35. Statics (3) I, II, III. The Staff (Romstad in charge)

Lecture—3 hours. Prerequisite: Mathematics 22C (may be taken concurrently); Physics 8A; enrollment open to Engineering students only. Force systems and equilibrium conditions with emphasis on engineering problems.

45. Properties of Materials (4) I, II, III. Munir in charge
Lecture—3 hours; laboratory—3 hours. Prerequisite: sophomore standing; enrollment open to Engineering students only. 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 (4) I, II. The Staff (Algazi in charge)

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 17. Introduction to theory and application of analog and digital circuits and systems. It is strongly recommended that students enroll in this course as soon as possible after completing Engineering 17.

102A. Dynamics (3) I, II, III. The Staff (Karnopp in charge)
Lecture—3 hours. Prerequisite: course 35; Mathematics 22B, 22C. Kinematics and kinetics of particles, of systems of particles, and of rigid bodies applied to engineering problems.

102B. Dynamics (3) II, III. Karnopp

Lecture—3 hours. Prerequisite: course 102A. Topics in rigid body dynamics; elementary dynamics of vibrating systems; introduction to energy methods.

102L. Dynamics Laboratory (1) II. Hubbard

Laboratory—3 hours. Prerequisite: course 102B (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.

103A. Elementary Fluid Mechanics (3) I, II, III. The Staff (Dwyer in charge)

Lecture—3 hours. Prerequisite: course 102A (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) II, III. Giedt

Lecture—3 hours. Prerequisite: course 103A. Incompressible viscous flow; boundary layer flow; one-dimensional compressible flow; fluid measurements; applications.

103L. Fluid Mechanics Laboratory (1) III. The Staff (Beadle in charge)

Laboratory—3 hours. Prerequisite: course 103B (may be taken concurrently). The basic principles and devices which are common in fluid mechanics are illustrated with a series of experimental demonstrations. The experiments are concerned with flow, pressure and viscosity measurement.

104A. Mechanics of Materials (3) I, II. The Staff (Romstad in charge)

Lecture—3 hours. Prerequisite: course 35, Mathematics 22B, 22C (may be taken concurrently). Uniaxial loading and deformation. General concepts of stress and strain. Stress-strain-temperature relations and yield criteria. Stresses in thin walled pressure vessels. Torsion of shafts. The concept of strain energy with applications to uniaxial loading and torsion problems.

104B. Mechanics of Materials (3) II, III. The Staff (Romstad in charge)

Lecture—3 hours. Prerequisite: course 104A. Stresses and deflections due to bending of beams. Application of energy methods to bending problems. Yielding and plastic deformation in beams, limit analysis. Buckling of columns.

104C. Mechanics of Materials (3) III. The Staff (Romstad in charge)

Lecture—3 hours. Prerequisite: course 104B. Selected topics including the analysis of plates, shells, curved beams, rings and arches. Torsion of noncircular shafts and thin walled sections.

105A. Thermodynamics (3) I, II, III. The Staff (McKillop in charge)

Lecture—3 hours. Prerequisite: Mathematics 22B and 22C. Fundamental concepts of thermodynamics, heat and the first law, thermal properties of gases, application of first law, cycles and the second law, reversibility, Carnot cycle and Kelvin temperature scale, entropy, thermodynamic diagrams, steam tables, and applications of thermodynamics to engineering systems.

105B. Thermodynamics (3) II, III. The Staff (Beadle in charge)

Lecture—3 hours. Prerequisite: course 105A. Review of first and second laws, review of power cycles, thermodynamic relations, gas and vapor mixtures, real gases, reactive processes of pure substances, phase and chemical equilibrium, and thermodynamics and statistical mechanics.

105L. Thermodynamics Laboratory (1) III. The Staff (Beadle in charge)

Laboratory—3 hours. Prerequisite: course 105B (may be taken concurrently). Demonstrations and experiments to illustrate the first and second laws of thermodynamics as

well as to show how various state variables such as temperature, pressure, etc., are measured and used to develop the state equations.

106. Engineering Economics (3) II, III. Carroad, Helweg
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. Miles, Chancellor
Lecture—2 hours; laboratory—2 hours. Prerequisite: course 17. Principles of AC and DC electric motors and solenoids, their control systems and power sources. Construction features, performance characteristics, and selection of motors for typical applications.

118. Probabilistic Systems Analysis (3) I, Algazi, Gardner, Jain

Lecture—3 hours. Prerequisite: Mathematics 21C. Probabilistic models and concepts in engineering. Introductory probability and statistics for engineers and scientists.

122. Introduction to Mechanical Vibrations (3) I, Hull

Lecture—3 hours. Prerequisite: course 102B. Free and forced vibrations in lumped-parameter systems with and without damping; vibrations in coupled systems; electro-mechanical analogs; use of energy conservation principles.

130. Thermodynamics of Materials Processes (4) II. Munir

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 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 (4) I. Shackelford

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 45; upper division standing. Structure of engineering materials on atomic scale will be described by exploring fundamentals of crystallography. Importance of this structure to materials' properties will be emphasized. Experimental determination of structure will be obtained using x-ray diffraction techniques.

134. Fundamentals of Rate Processes in Materials Science (3) II. Munir

Lecture—3 hours. Prerequisite: courses 45 and 105A or 130. Basic kinetic laws. Theory of Absolute Reaction Rates. Applications in diffusion, nucleation, solidification, evaporation, and sintering processes.

140. Materials in Engineering Design (4) III. The Staff

(Beadle in charge)
Lecture—3 hours; discussion—1 hour. Prerequisite: senior standing in Engineering or consent of instructor. Descriptive treatment of common engineering materials. Mechanical properties of typical materials including metals, woods, cements, polymers and glasses. Principles of heat treatment and fabrication as they affect design parameters, and applications in engineering will be emphasized.

142. Principles of Nondestructive Testing (4) I, Shackelford

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing. 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.

144. Corrosion and Oxidation of Engineering

Materials (3) I, Munir
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.

146. Materials Laboratory (3) II, III. Howitt

Laboratory—8 hours. Prerequisite: enrollment open only to majors or double majors in Materials Science and Engineering; course 45 recommended. Investigation of materials behavior and understanding of this in relation to fundamental principles of materials science will be emphasized.

148. Engineering Applications of Materials Principles (4) III. Mukherjee

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 45 and 105A (or the equivalent); upper division standing in Engineering. The physical principles in metallic, polymeric and ceramic materials are discussed with em-

phasis on microstructure and engineering applications. The strengthening processes, mechanical failure modes and service stability of materials systems are outlined.

160. Energy, Society, and the Environment (4) I. The Staff (Beadle in charge)

Lecture—3 hours; discussion—1 hour. Overview of energy; uses, resources, energy conversion, technology and environmental problems. Interactions of society with technology, politics and economics are considered. Current and future energy systems are studied; nuclear, fossil fuel, geothermal, solar and others. For engineering and nonengineering students. (Lower division students are referred to Environmental Studies 20.)

162. Advanced Energy Technology (3) III. Craig

Lecture—3 hours. Prerequisite: course 105A. Broad coverage of the basic features of the new energy technologies. Recovery of oil from oil shale, coal conversion, gas stimulation, hydrogen production, solar power, fission power, controlled thermonuclear reactors, laser fusion, synthetic fuels, geothermal power, energy from bioconversion. (P/NP grading only.)

180. Engineering Analysis (3) I, III. Giedt, Brandt

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.

190. Professional Responsibilities of Engineers (3) II, III. The Staff (Brandt in charge)

Lecture—3 hours. Organization of the engineering profession; engineering and management; introduction to contracts, specifications, and business law; technical writing; oral presentations on the interactions between engineering and society.

Graduate Course

291. Seminar in Teaching (1) III. J. Henderson, Baughn
Seminar—1 hour. Discussion of previous experience as a student and actual practice as a teacher. (S/U grading only.)

Engineering: Agricultural

(College of Engineering)

Roger E. Garrett, Ph.D., Chairperson of the Department

Department Office, 2030 Bainer Hall (752-0102)

Faculty

Norman B. Akesson, M.S., Professor
Jaime Amorocho, Ph.D., Professor
Roy Bainer, M.S., LL.D., Professor Emeritus
David E. Brune, Ph.D., Assistant Professor
Robert H. Burg, M.S., Professor
Paul A. Carroad, Ph.D., Assistant Professor
William J. Chancellor, Ph.D., Professor
Pictiaw (Paul) Chen, Ph.D., Professor
Roger E. Garrett, Ph.D., Professor
John R. Goss, M.S., Professor
Delbert W. Henderson, Ph.D., Professor
S. Milton Henderson, M.S., Sc.D., Professor Emeritus
David J. Hills, Ph.D., Assistant Professor
M. Stephen Kaminaka, Ph.D., Assistant Professor
Robert A. Kepner, B.S., Professor
Coby Lorenzen, Jr., M.S., Professor Emeritus
James N. Luthin, Ph.D., Professor
Miguel A. Mariño, Ph.D., Professor
R. Larry Merson, Ph.D., Professor
John A. Miles, Ph.D., Assistant Professor
Stanton R. Morrison, Ph.D., Professor
Loren W. Neubauer, Ph.D., Professor Emeritus
Michael O'Brien, Ph.D., Professor
William O. Pruitt, M.S., Lecturer
Thomas R. Rumsey, Ph.D., Assistant Professor
Verne H. Scott, Ph.D., Professor

R. Paul Singh, Ph.D., Associate Professor
Henry E. Studer, M.S., Professor
Wesley E. Yates, M.S., Professor

Courses in Engineering: Agricultural

Lower Division Courses

- 1. The Agricultural Engineer in Tomorrow's World** (1) II. Garrett
Discussion—2 hours. Exploration of opportunities in Agricultural Engineering as they relate to society, environment, and biological systems, including interdisciplinary approaches. Discussions and demonstrations of agricultural engineering projects illustrating design, development, testing, and evaluation methods. (P/NP grading only.)
- 2. Introduction to Forest Engineering** (1) III. Miles
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.)
- 92. Internship in Agricultural Engineering** (1-5) I, II, III. The Staff (Garrett in charge)
Work-learn experience. Prerequisite: lower division standing; approval of project prior to period of internship. Supervised work-study experience in agricultural engineering. May be repeated for credit. (P/NP grading only.)
- 98. Directed Group Study** (1-5) I, II, III. The Staff (Garrett 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 (Garrett in charge)
(P/NP grading only.)

Upper Division Courses

- 112. Engines for Agriculture, Industry and Transportation** (3) III. Kaminaka
Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 105A. Operational and performance characteristics of internal combustion engines with emphasis on combustion and emission control. Engineering comparison of alternative power units with conventional engines. Design criteria for engines used in agriculture, industry, and transportation.
- 114. Principles of Field Machinery Design** (3) III. Yates
Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 102A. Functional requirements and basic operating principles of field machines; elements of field machinery design; use of instrumentation and computer techniques for analysis of specific machines.
- 115. Forest Engineering** (3) II. Miles
Lecture—3 hours. Prerequisite: Civil Engineering 10, Engineering 102A and 104A; Forestry 100A, 100B, 100C (Berkeley campus) strongly recommended. Applications of engineering principles to problems in the forest industry, including consideration of nursery operations, reforestation, harvesting, road layout, log transport and milling operations.
- 116. Forest Engineering Field Problems** (2) III. 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.
- 117. Stability and Traction of Off-Road Vehicles** (2) I, Chancellor
Lecture—2 hours. Prerequisite: Engineering 102A and 104A. Mechanics of interactions between paved or soil surfaces and tires or tracks. Vehicle response to external and dynamic forces during pulling, turning, lifting and transport. Effects of design parameters and component characteristics on vehicle performance and safety.
- 118. Testing and Evaluation of Engineering Designs** (3) III. Chen
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 150 (preferred) or Civil Engineering 132A or 145, or Mechanical Engineering 150A, or Water Science 110B. Methods and procedures for evaluating functional adequacy, reliability, maintainability and safety of designs. Failure modes; test design; data analysis; accelerated testing; field testing; case studies.
- 119. Hydraulic and Pneumatic Systems** (3) I, Studer
Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 103A. Design of hydraulic and pneumatic systems for powering, sensing and controlling machine functions. Characteristics of pumps, motors, control valves, fluidic devices, servo-mechanisms, and hydraulic fluid. Testing of component and system performance.
- 125. Agricultural Structures: Environmental Aspects** (3) I, Morrison
Lecture—3 hours. Prerequisite: Engineering 105A. Environmental and functional design of agricultural storage and production facilities; plans and systems; ventilating, heating, lighting, insulating; psychometrics, energy balances, vapor transmission; solar heat loads, sol-air concept; methods of waste management.
- 133. Mechanical Unit Operations and Processes** (3) II. Rumsey
Lecture—2 hours; laboratory—2 hours. Prerequisite: Engineering 103A. Mechanical unit operations applied to such processes as non-Newtonian flow, size reduction, sorting and mixing of granular materials, materials handling, storage, plant layout, work efficiency, etc.
- 134. Thermal Unit Operations and Processes** (3) III, Singh
Lecture—2 hours; laboratory—2 hours. Prerequisite: Engineering 105A. Thermal unit operations related to drying, refrigeration, freezing, cold storage, evaporation, boiling, distillation, etc.
- 140. Seepage and Drainage** (3) III. Luthin
Lecture—3 hours. Prerequisite: Engineering 103A. Flow through porous media; measurement of hydraulic conductivity; seepage under hydraulic structures; anisotropy flow nets; drainage design for water table and salt control. Offered in odd-numbered years.
- 141. Sprinkler and Drip Irrigation System Design** (3) III. The Staff (Garrett in charge)
Lecture—2 hours; Laboratory-discussion—3 hours. Prerequisite: Engineering 103A, Water Science 110B or 160; Civil Engineering 141 recommended. Design and evaluation of sprinkler and drip irrigation systems.
- 150. Engineering Design Projects for Agriculture and Forestry** (2) II. Kepner
Laboratory-discussion—two 2-hour sessions. Prerequisite: any two of the following (one may be taken concurrently): courses 114, 115, 125, 133; Civil Engineering 145; Mechanical Engineering 150A; Water Science 110A, 110B, 160. 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 the instructor.
- 157. Human Factors in Engineering and Design** (3) II. Kaminaka
Lecture—2 hours; Laboratory—3 hours. Principles of human factors; applications of human factors data to engineering design.
- 192. Internship in Agricultural Engineering** (1-5) I, II, III. The Staff (Garrett in charge)
Work-learn experience. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work-study experience in agricultural engineering. May be repeated for credit. (P/NP grading only.)
- 198. Directed Group Study** (1-5) I, II, III. The Staff (Garrett in charge)
Prerequisite: consent of instructor. (P/NP grading only.)
- 199. Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Garrett in charge)
(P/NP grading only.)

Graduate Courses

- 215. Soil-Machine Relations in Tillage and Traction** (3) I, Chancellor
Lecture—3 hours. Prerequisite: course 114 or 117. 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.
- 235. Advanced Unit Operations in Process and Food Engineering** (3) III. Rumsey
Lecture—3 hours. Prerequisite: an upper division course in process or food engineering. Basic procedures applicable to process and food engineering. Heat and mass transfer applications to drying, dehydration and freezing; flow of food and semi-fluid materials; size reduction; respiration of bio-materials.
- 242. Hydraulics of Surface Irrigation** (3) III. The Staff (Garrett in charge)
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. Agricultural Wastes Management (3) II. Hills
Lecture—2 hours; discussion-laboratory—1 hour. Prerequisite: consent of instructor. Animal, crop and food processing wastes; pesticides, fertilizers, odors, dust and smoke in relation to environmental pollution. Disposal needs, present and future. Regulation, economics and public concern; coordination with municipal and industrial wastes management.

250. Design of Mechanical Systems (2) II. Goss
Lecture—2 hours. Prerequisite: mechanical design and economics recommended. Experience with design; evaluating design concepts and establishing design criteria; analysis and synthesis in design; optimization techniques; human factors in design.

255. Environmental Engineering in Agriculture (3) I, Morrison
Lecture—3 hours. Prerequisite: Mechanical Engineering 165. The description, methods of measurement and effect on man, animals and plants of physical environmental factors, and the design of systems for their control. Offered in odd-numbered years.

265. Design and Analysis of Engineering Experiments (4) II. Studer
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.

275. Physical Properties of Agricultural 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 agricultural materials.

289A-D. Selected Topics in Agricultural Engineering (1-5) I, II, III. The Staff (Garrett in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Directed group study of selected topics with separate sections: (A) Simulation of Food Processing Systems; (B) Thermal Process Design; (C) Fermentation Engineering; (D) Alternate Energy Systems.

290. Seminar (1) III. The Staff (Goss in charge)
Seminar—1 hour. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Garrett in charge)

299. Research (1-12) I, II, III. The Staff (Studer in charge)
(S/U grading only.)

Engineering: Applied Science

(College of Engineering)

Frederick O. Wooten, Ph.D., Chairperson of the Department

Department Office, 228 Walker Hall (752-0360)

Faculty

Roger E. Anderson, Ph.D., Lecturer
Guy A. Armantrout, Ph.D., Lecturer
Charles F. Bender, Ph.D., Lecturer
Barry L. Berman, Ph.D., Lecturer
Arthur H. Biermann, Ph.D., Lecturer
Stewart D. Bloom, Ph.D., Professor
David C. Camp, Ph.D., Lecturer
Paul P. Craig, Ph.D., Professor
John S. DeGroot, Ph.D., Professor
C. Peter DeNeef, Ph.D., Associate Professor
William B. Durham, Ph.D., Lecturer
John G. Fletcher, Ph.D., Lecturer
John C. Garrison, Ph.D., Lecturer
Alexander Glass, Ph.D., Lecturer
Abraham Goldberg, Ph.D., Adjunct Professor

Michael W. Guinan, Ph.D., Lecturer
 Edwin B. Hooper, Ph.D., Lecturer
 William G. Hoover, Ph.D., Adjunct Professor
 Paul W. Kasameyer, Ph.D., Lecturer
 John Killeen, Ph.D., Professor
 William L. Krueger, Ph.D., Lecturer
 Stephen Levine, Ph.D., Lecturer
 Kenneth D. Marx, Ph.D., Lecturer
 Nelson Max, Ph.D., Lecturer
 James R. McGraw, Ph.D., Assistant Professor
 George A. Michael, B.S., Lecturer
 Fred P. Milanovich, Ph.D., Lecturer
 Arthur A. Mirin, Ph.D., Lecturer
 Danny N. Nessett, Ph.D., Lecturer
 William A. Newcomb, Ph.D., Adjunct Professor
 Richard F. Post, Ph.D., Professor in Residence
 Daniel R. Ries, Ph.D., Lecturer
 Garry Rodrigue, Ph.D., Lecturer
 Dalton D. Schnack, Ph.D., Lecturer
 Gordon L. Struble, Ph.D., Lecturer
 Abraham Szoke, Ph.D., Lecturer
 Wilson K. Talley, Ph.D., Professor
 C. Bruce Tarter, Ph.D., Lecturer
 Edward Teller, Ph.D., University Professor Emeritus
 Donald L. Vickers, Ph.D., Lecturer
 John J. Walton, Ph.D., Lecturer
 Richard W. Watson, Ph.D., Lecturer
 Frederick O. Wooten, Ph.D., Professor
 Jeffrey W. Yeh, Ph.D., Lecturer
 Yin Yeh, Ph.D., Professor
 Mary E. Zosel, Ph.D., Lecturer

**Courses in Engineering:
 Applied Science**

Davis

Lower Division Courses

- 98. Directed Group Study** (1-5) I, II, III. The Staff (Wooten in charge)
 Prerequisite: consent of instructor. Restricted to lower division students. Group study of selected topics. (P/NP grading only.)
- 99. Special Study for Undergraduates** (1-5) I, II, III. The Staff (Wooten in charge)
 Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

- 115. Introduction to Numerical Methods for Computers** (3) I, II, III. The Staff (Wooten in charge)
 Lecture—3 hours. Prerequisite: Engineering 5; Mathematics 22B. Lectures and laboratory work on electronic computers and their application to engineering problems.
- 135A. Introductory Nuclear Science and Technology** (3) I, Craig
 Lecture—3 hours. Prerequisite: Physics 121 or the equivalent. Introductory aspects of nuclear phenomena, nuclear masses, size, energy, and decay modes. Interaction of particles and electromagnetic radiation with matter. Instrumentation and theory of measurements; neutron technology. Nuclear chemistry.

- 180. Introduction to Plasma Physics and Controlled Fusion** (4) III. DeGroot
 Lecture—3 hours; laboratory—3 hours. Prerequisite: Physics 110B and 112A, or Engineering 105A and Electrical and Computer Engineering 130B, or consent of instructor. Thermonuclear reactions, possible approaches to controlled fusion, equilibrium plasma properties — plasma sheaths; plasma sources, plasma diagnostics, magnetohydrodynamics; kinetic theory; plasma stability; confinement systems.
- 188. Group Study** (1-5) I, II, III. The Staff (Wooten in charge)
 Prerequisite: consent of instructor. Group study of selected topics. Students may enroll in one or more separate sections. (P/NP grading only.)
- 199. Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Wooten in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

- 210A-210B-210C. Advanced Methods of Computational Physics** (3-3-3) I-II-III. Killeen
 Lecture—3 hours. Prerequisite: course 209A-209B or Mathematics 228A-228B or the equivalent. Computational

methods in various fields including: hydrodynamics, plasma physics, magnetohydrodynamics, Vlasov and Fokker-Planck equations, particle codes, neutron and radiation transport, chemical kinetics, and atmospheric modeling.

- 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. Y. Yeh
 Lecture—3 hours. Prerequisite: course 205C. 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 and Mathematics 101. 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 materials. Modern applications of theory.

- 260A-260B-260C. Statistical Mechanics of Equilibrium and Transport Phenomena** (3-3-3) I-II-III. Wooten
 Lecture—3 hours. Prerequisite: Physics 121; Mathematics 118A. Statistical formulation of thermodynamics and transport phenomena. Computer calculation and simulation of many-body systems.

- 280A-280B-280C. Plasma Physics and Controlled Fusion** (3-3-3) I-II-III. DeGroot
 Lecture—3 hours. Prerequisites: courses 260A, 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.

- 285A-285B-285C. Advanced Plasma Physics** (3-3-3) I-II-III. Post
 Lecture—3 hours. Prerequisite: courses 280A-280B-280C. Plasma kinetic theory; applications of the Fokker-Planck equation; advanced instability theory. Practical problems of plasma production and confinement. Nonlinear and relativistic effects including quasi-linear theory, relativistic beams, synchrotron radiation and laser heating of plasmas. Computer simulation of plasma phenomena.

- 289A-J. Special Topics in Applied Science** (1-5) I, II, III. The Staff (Wooten in charge)
 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 (Wooten in charge)
 Seminar—1-2 hours. (S/U grading only.)
- 298. Group Study** (1-5) I, II, III. The Staff (Wooten in charge)
 Such topics as neutron physics, nuclear technology, advanced hydrodynamics, plasma physics, or advanced mathematics.

- 299. Research** (1-12) I, II, III. The Staff (Wooten in charge)
 (S/U grading only.)

Livermore

Upper Division Courses

- 112A-112B. Introduction to Computing Science** (3-3) I-II. The Staff (Wooten in charge)
 Lecture—3 hours. Prerequisite: some knowledge of programming or consent of instructor. Topics cover range of computing science, including computer architecture, assembly and higher-level programming languages, algorithm development and design, use of computer systems, applications of computers, construction of systems from micro-computer elements. Heavy emphasis on independent student programming projects. Several programming languages learned by usage. Guest lecturers provide much course material. Basic computing.
- 115. Introduction to Numerical Methods for Computers** (3) I, Talley
 Lecture—3 hours. Prerequisite: Engineering 5; Mathematics 22B. Lectures and laboratory work on electronic computers and their application to engineering problems.

- 134. Introduction to Electromagnetic Theory** (3) I, Talley
 Lecture—3 hours. Prerequisite: ordinary differential equations and elementary classical mechanics. Electrostatic

and magnetostatic properties of materials; electromagnetic waves in vacuum, dielectric media, and at interfaces; radiative effects from moving particles; charged particles in electromagnetic fields.

- 135A. Introductory Nuclear Science and Technology** (3) I, Bloom
 Lecture—3 hours. Prerequisite: Physics 121 or the equivalent. Introductory aspects of nuclear phenomena, nuclear masses, size, energy, and decay modes. Interaction of particles and electromagnetic radiation with matter. Instrumentation and theory of measurements; neutron technology. Nuclear chemistry.

- *135B. Introductory Nuclear Science and Technology** (3) II, Bloom
 Lecture—3 hours. Prerequisite: course 135A or the equivalent. Techniques of radiation and particle detection; nuclear instrumentation techniques; pulse height analysis; coincidence measurement; technology of charged particles and neutrons.

- *135C. Introductory Nuclear Science and Technology** (3) III, Bloom
 Lecture—3 hours. Prerequisite: course 135B or the equivalent. Production and uses of radioisotopes in industry, chemical, and biochemical research. Chemistry of radioactivity in the environment. Chemistry and properties of uncommon materials for reactor operation, e.g., zirconium, thorium, and major fission products. Wastes from nuclear power plants.

- 148. Structure of the Earth** (3) I, Kasameyer,
 Lecture—3 hours. Prerequisite: consent of instructor. Composition and structure of the interior of the earth—evidence from cosmology, the solar system, seismology, and petrology. Introduction to plate tectonics and continental drift.

- 198. Group Study** (1-5) I, II, III. The Staff (Wooten in charge)
 Prerequisite: consent of instructor. Group study of selected topics. Students may enroll in one or more separate sections. (P/NP grading only.)

- 199. Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Wooten in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

- 201A-201B. Complexity of Computer Computations** (3-3) II-III. Fletcher
 Lecture—3 hours. Prerequisite: courses 112A-112B (or the equivalent); Electrical and Computer Engineering 191. Models of computation and measure of complexity. Relationship between various models. Basic data structures and programming techniques. Manipulation of sets, strings, graphs, and numbers. Efficient and optimal algorithms for sorting and searching; integer, polynomial, and matrix arithmetic and pattern matching. Polynomial complete problems. Hierarchies of complexity and reducibilities among problems.

- 202A-202B. Formal Languages and Automata Theory** (3-3) II-III. The Staff (Wooten in charge)
 Lecture—3 hours. Prerequisite: Electrical and Computer Engineering 191 (or the equivalent). A survey of automata and language theory; particular emphasis on finite automata, context-free languages and Turing machines. Introduction to computability and computational complexity. Decidability of language questions. Structure theorems for languages and machines. Introduction to parsing theory.

- 203A. Computer Architecture** (3) I. Anderson
 Lecture—3 hours; programming project performed. Prerequisite: courses 112A-112B or the equivalent. Hardware knowledge for software designers. Students learn how hardware functions, what elements compose it, how to read prints and logic diagrams. Course considers simple machine architecture in detail, hardware design alternatives, input-output methods and computer peripherals.

- 203B. Computer Architecture** (3) II. Anderson
 Lecture—3 hours; research paper and programming project. Prerequisite: course 203A. Topics in computer communication, hardware features to enhance operating systems, and advanced architectures.

- 204. Data Structures** (3) I. The Staff (Wooten in charge)
 Lecture—3 hours. Prerequisite: Electrical and Computer Engineering 191 or the equivalent. Data structures and algorithms; linear data structures and their representations; sort and search with the linear data structures; non-linear data structures and their representations; tree traversing, searching, sorting, and balancing; graph applications; list processing and pure LISP; garbage collection and the dynamic storage allocations; file structures and the database management systems.

- 205A. Mathematical Methods** (3) I, Killeen
 Lecture—3 hours. Prerequisite: introductory courses in ordinary differential equations, vector analysis, infinite series, and functions of a complex variable. Calculus of

finite and infinite dimensional vector spaces; orthonormal functions; linear equations. Applications of these analytical techniques to physical systems.

205B. Mathematical Methods (3) II. Killeen

Lecture—3 hours. Prerequisite: course 205A or the equivalent. Differential equations in the complex plane; contour integration; conformal mapping; Fourier and Laplace transforms; calculus of variations; applications of these techniques to physical systems.

205C. Mathematical Methods (3) III. Killeen

Lecture—3 hours. Prerequisite: course 205B or the equivalent. Eigenvalue problems; solution of linear differential and integral equations by expansions in orthonormal functions; Green's functions; approximation methods; applications to physical systems.

207A-207B. Software Systems (3-3) I-II. McGraw

Lecture—3 hours. Prerequisite: courses 201A, 201B (or the equivalent). Organization and design of operating systems and computer networks, including hardware requirements, interfacing, communication, buffering, processes, scheduling, resource control, file structure, and user interaction. The Octopus network as an example. Programming practice provided.

209A-209B. Numerical Solutions of Partial Differential Equations (3-3) II-III. Mirin

Lecture—3 hours. Prerequisite: courses 115, 205A, 205B, 205C. Numerical methods applicable to the solution of partial differential equations will be discussed. The emphasis will be on finite difference methods for hyperbolic, parabolic and elliptic systems. Material covering characteristic methods, finite element methods, and Monte-Carlo methods will also be included.

210A-210B-210C. Advanced Methods of Computational Physics (3-3-3) I-II-III. Marx

Lecture—3 hours. Prerequisite: course 209A-209B or Mathematics 228A-228B or the equivalent. Computational methods in various fields including: hydrodynamics, plasma physics, magnetohydrodynamics, Vlasov and Fokker-Planck equations, particle codes, neutron and radiation transport, chemical kinetics, and atmospheric modeling.

211. Computer Mathematics (3) II. The Staff (Wooten in charge)

Lecture—3 hours. Prerequisite: course 115 (may be taken concurrently). Review and survey of mathematical fields fundamental to computer science. Theory of sets, Boolean algebra and propositional calculus, predicate calculus, probability and statistics, mathematical programming, general number system, information theory and coding. Offered in odd-numbered years.

212A-212B. Design and Translation of Programming Languages (3-3) I-II. McGraw

Lecture—3 hours. Prerequisite: courses 112A-112B and Electrical and Computer Engineering 191 (or the equivalent). The theory and practice involved in designing and implementing a programming language and its software support system. Course projects will include implementation of a macro processor, a compiler, a relocating loader, and a computer simulator. The theoretical background needed will be developed during the courses.

213. Switching Theory (3) II. The Staff (Wooten in charge)

Lecture—3 hours. Prerequisite: course 211. Minimization techniques, switching function realization with electronic circuits, trees, storage devices, and elementary sequential machines. Offered in odd-numbered years.

214. Computing with Symbolic Expressions (3) III. Fletcher

Lecture—3 hours. Prerequisite: courses 201A-201B and 211 or the equivalent. Theory and practice of computing with symbolic expressions. The LISP and SNOBOL programming languages. Writing programs to manipulate symbolic expressions. Algebraic manipulation. Proving the equivalence of algorithms. Survey of symbol manipulation languages. Offered in even-numbered years.

215. Computer Languages (3) I. The Staff (Wooten in charge)

Lecture—3 hours. Prerequisite: courses 212A-212B (or the equivalent). Survey of several types of computer languages, with an example of each: assembly, macro, numerical, string, list, simulation.

216. Infinite Automata (3) III. Fletcher

Lecture—3 hours. Prerequisite: courses 201A-201B and 211 or the equivalent. Ideal computing machines, including Turing machines. Limitations of finite machines; regular sets. Computability and decidability. Godel's proof. Offered in odd-numbered years.

218. The Theory of Parsing (3) III. The Staff (Wooten in charge)

Lecture—3 hours. Prerequisite: courses 202A-202B. Discussion of basic techniques now available for parsing context-free languages. Detailed descriptions of various pars-

ing algorithms, and proofs of their correctness. Particular interest in the construction and use of these techniques in compiler-compilers and translator writing systems. Offered in even-numbered years.

219. Computer Science Applications (3) I, II, III. The Staff (Wooten in charge)

Lecture—3 hours. Prerequisite: courses 201A-201B and 211 or the equivalent. The solution of (chiefly non-numerical) problems by computer. One or more such problems will be chosen (based on the interests of instructor and students) from such areas as artificial intelligence, language translation, process control, image analysis, etc. Offered as need arises.

224. Microprogramming and Microprogrammable Architecture (3) III. Anderson

Lecture—3 hours. Prerequisite: consent of instructor. Concepts of microprogramming, design and implementation of the internal logic and data to form the hardware primitives. Survey of the architecture of commercially available, user-microprogrammable computers. The course includes a programming project on a department computer.

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.

229. Materials Science (3) II. Guinan

Lecture—3 hours. Prerequisite: course 205C. Facts and theories of crystal defect physics and their application to such problems as the mechanical properties of solids, radiation damage, phase transformations, etc. Covers thermodynamics of point defects, diffusion, elasticity dislocation theory.

230A-230B-230C. Structure of Matter (3-3-3) I-II-III. Goldberg

Lecture—3 hours. Prerequisite: course 205C. 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.

233A-233B-233C. Theory and Applications of Solid-State Physics (3-3-3) I-II-III. The Staff (Wooten in charge)

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. Goldberg

Lecture—3 hours. Prerequisite: Electrical and Computer Engineering 131B and Mathematics 101. 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.

235A-235B. Nuclear Physics (3-3) II-III. Bloom

Lecture—3 hours. Prerequisite: course 230C. Basic properties of nuclei; radioactive decay; nuclear models; low energy nuclear reactions; neutron physics. Interaction of particles and radiation with matter.

236. Theory of Particle Reactions (3) I. Bloom

Lecture—3 hours. Prerequisite: courses 135A, 230C, 234B. General theory of atomic and nuclear reactions; cross-sections for the collision of electrons, photons, and nuclear particles with atoms and/or nuclei. Decay properties by particles emission of unstable atoms or nuclei.

237A-237B. Neutron Physics (3-3) II-III. Talley

Lecture—3 hours. Prerequisite: course 135A. Properties of neutrons, cross-sections and nuclear structure, fast neutrons, neutron resonances, fission process, thermal neutrons, neutron optics, diffraction, applications of neutron diffraction and optics to studies of the structure of matter. Offered in odd-numbered years.

239A-239B. Nuclear Chemistry (3-3) II-III. The Staff (Wooten in charge)

Lecture—3 hours. Prerequisite: course 135A. Radiochemistry as an analytical technique in the study of chemical and nuclear processes: activation analysis, fission, properties of the actinides, current theories of the properties of the transactinides, radiolysis, "hot atom" chemistry, and mechanisms of biological radiation damage. Offered in even-numbered years.

248A-248B. Physics and Chemistry of the Earth (3-3) II-III. Kasameyer

Lecture—3 hours. Prerequisite: Geology 105 or the equivalent, and course 205A-205B-205C. Physical and chemical descriptions of the crust, mantle, and core; plate tectonics, convection, sea floor spreading, evolution of the earth; applications resource recovery, constitution of the earth, seis-

mic structure, phase changes, thermal regime, equation-of-state, and electrical properties.

250. Seismology (3) III. The Staff (Wooten in charge)

Lecture—3 hours. Prerequisite: course 205A-205B-205C; consent of instructor. Seismology and the utilization of seismic waves for the study of the earth's interior and tectonics. Elastic wave theory, elastic wave propagation in layered media, dispersion seismic ray theory, interpretation of travel-times, surface-wave-dispersion and free-oscillations of the earth.

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. Newcomb

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.

260A-260B-260C. Statistical Mechanics of Equilibrium and Transport Phenomena (3-3-3) I-II-III. Milanovich

Lecture—3 hours. Prerequisite: Physics 121; Mathematics 118A. Statistical formulation of thermodynamics and transport phenomena. Computer calculation and simulation of many-body systems.

265A-265B-265C. Theory and Applications of Lasers (3-3-3) I-II-III. Glass

Lecture—3 hours. Prerequisite: course 230C and 234B or the equivalent. Theory of lasers, properties of laser systems, electro-optical devices. Interaction of light with matter, laser spectroscopy, nonlinear optics. Theory of the coherent photon field, Fourier optics, holography, application of lasers in technology.

280A-280B-280C. Plasma Physics and Controlled Fusion (3-3-3) I-II-III. Post

Lecture—3 hours. Prerequisites: courses 260A, 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.

285A-285B-285C. Advanced Plasma Physics (3-3-3) I-II-III. Post

Lecture—3 hours. Prerequisite: courses 280A-280B-280C. Plasma kinetic theory; applications of the Fokker-Planck equation; advanced instability theory. Practical problems of plasma production and confinement. Nonlinear and relativistic effects including quasi-linear theory, relativistic beams, synchrotron radiation and laser heating of plasmas. Computer simulation of plasma phenomena.

289A-J. Special Topics in Applied Science (1-5) I, II, III. The Staff (Wooten in charge)

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 (Wooten in charge)

Seminar—1-2 hours. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Wooten in charge)

Such topics as computer science, plasma physics, materials science, laser applications, bio-medicine.

299. Research (1-12) I, II, III. The Staff (Wooten in charge)

(S/U grading only.)

Engineering: Chemical

(College of Engineering)

Benjamin J. McCoy, Ph.D., Chairperson of the Department

Department Office, 3092 Bainer Hall (752-0400)

Faculty

Richard L. Bell, Ph.D., Professor
 Ruben G. Carbonell, Ph.D., Associate Professor
 Alan P. Jackman, Ph.D., Associate Professor
 Benjamin J. McCoy, Ph.D., Professor
 David F. Ollis, Ph.D., Professor
 J. M. Smith, Sc.D., Professor (*Chemical Engineering, Food Science and Technology*)
 Stephen Whitaker, Ph.D., Professor

Courses in Engineering: Chemical**Lower Division Courses**

1. The Scope of Chemical Engineering (1) II. The Staff (McCoy in charge)

Lecture—1 hour; discussion—1 hour. Demonstrations and discussions of the opportunities in chemical engineering for professional development, contributions to basic knowledge, and service to society. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (McCoy in charge)

Prerequisite: consent of instructor; restricted to lower division students. Group study of selected topics. Students may enroll in more than one section. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (McCoy in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

150A. Chemical Engineering Fluid Mechanics (3) II. Bell
 Lecture—3 hours. Prerequisite: Engineering 102A and Mathematics 22A. 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. Students electing this course may not receive credit for Engineering 103A.

150B. Chemical Engineering Fluid Mechanics (3) III. Carbonell

Lecture—3 hours. 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. Students electing this course may not receive credit for Engineering 103B.

151. Material and Energy Balances (3) I, Smith

Lecture—3 hours. Prerequisite: Chemistry 110A and 128B (may be taken concurrently). Use of principles of conservation of mass and energy in chemical process calculations.

152A. Chemical Engineering Thermodynamics (3) II. McCoy
 Lecture—3 hours. Prerequisite: course 151; Chemistry 110A. Application of principles of thermodynamics to chemical processes.

152B. Chemical Engineering Thermodynamics (3) III. Jackman
 Lecture—3 hours. Prerequisite: course 152A. Continuation of course 152A.

153. Chemical Engineering Heat Transfer (4) III. The Staff (McCoy in charge)

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 (3) I, Bell
 Lecture—3 hours. 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 (McCoy in charge)

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 (McCoy in charge)

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 (McCoy in charge)
 Laboratory—12 hours. Prerequisite: courses 154B, 155A. Continuation of 155A.

156A. Chemical Engineering Kinetics (3) II. Smith
 Lecture—3 hours. 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 (3) III. Smith
 Lecture—3 hours. Prerequisite: course 156A. Continuation of course 156A.

157. Process Dynamics and Control (4) I, III. Jackman
 Lecture—3 hours; Laboratory—3 hours. Prerequisite: courses 152B, 153. Fundamentals of the dynamics of linear chemical processes. Classical feedback and feed forward control of dynamic processes. Direct digital control. Laboratory experiments in process dynamics, analog and digital feedback control.

158. Chemical Engineering Process Design (3) III. McCoy
 Lecture—3 hours. Prerequisite: courses 154B and 156A. Chemical Engineering process design; optimization and economics.

159. Chemical Engineering Analysis (3) I. The Staff (McCoy in charge)

Lecture—3 hours. Chemical engineering applications of partial differential equations, tensors, systems of linear equations, and operational calculus.

160. Design of Piping Systems and Heat Exchangers (2) II. Jackman

Lecture—2 hours. Prerequisite: course 150B and 153 or the equivalent. Design of piping systems including pumps, compressors and valves. Shortcut methods for approximating pressure drop in piping. Design of shell and tube heat exchangers.

198. Group Study (1-5) I, II, III. The Staff (McCoy in charge)

Prerequisite: consent of instructor. Group study of selected topics. Student groups may be organized in instrumentation and design problems. Students may enroll in one or more separate subjects. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (McCoy in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

252. Advanced Thermodynamics (3) I, Smith
 Lecture—3 hours. Prerequisite: course 152B or Engineering 105B. A general treatment of the first and second laws; applications of thermodynamic relationships to phase and chemical reaction equilibria; introduction to statistical thermodynamics.

253A. Advanced Transport Phenomena (4) I, Carbonell
 Lecture—4 hours. Prerequisite: course 153. Tensor and vector methods in the formulation of equations of mass, momentum, energy, and entropy in continuous media with particular emphasis on fluids. Applications to the formulation of rheological equations of state for viscoelastic fluids and fluid interfaces.

253B. Advanced Transport Phenomena (4) II. The Staff (McCoy in charge)

Lecture—4 hours. Prerequisite: course 253A or consent of instructor. Application to both differential and integral mass, momentum, and energy balances. Radiant energy transport and heat transfer in reacting systems.

253C. Advanced Transport Phenomena (3) III. Whitaker
 Lecture—3 hours. Prerequisite: course 253B. Continuation of course 253B with special emphasis on multicomponent systems. The laws of molecular diffusion and energy transport, including the effects of concentration, temperature, electric and pressure fields. Convective mass transfer and chemically reacting flows.

254. Molecular Theory of Transport Phenomena (3) II. The Staff (McCoy in charge)

Lecture—3 hours. The transport of mass, momentum, and energy is considered from the molecular point of view. Derivations of the Boltzmann equation are considered, and solutions for special cases are discussed. Methods for calculating transport coefficients are presented.

256. Applied Kinetics and Reactor Design (3) II. Whitaker
 Lecture—3 hours. Prerequisite: courses 156B and 252 or consent of instructor. Application of kinetics and molecular transport rates to the design of chemical reactors with emphasis on homogeneous systems.

258. Chemical Process Dynamics (3) I. The Staff (McCoy in charge)

Lecture—3 hours. Prerequisite: courses 154B, 156B. Unsteady-state process analysis, examples of first and second order process systems, coupling of mixed order pro-

cesses including chemical reaction kinetics, mass and heat transfer and fluid mechanics, simulation of chemical processes.

260. Separation Processes: Particulate Systems (3) I, McCoy

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.

261. Separation Processes: Column Operations (3) III. McCoy

Lecture—3 hours. Prerequisite: course 154B. Analysis and design of chemical separation processes: distillation, extraction, chromatography, adsorption. Finite difference equations, unified design methods, axial dispersion models, probability and random walk theories, method of characteristics, moment analysis, optimization.

290. Seminar (1) I, II, III. The Staff (McCoy in charge)
 Seminar—1 hour. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (McCoy in charge)

299. Research (1-12) I, II, III. The Staff (McCoy in charge) (S/U grading only.)

Engineering: Civil

(College of Engineering)

Karl M. Romstad, Ph.D., Chairperson of the Department

Department Office, 206 Walker Hall (752-0586)

Faculty

Jaime Amorocho, Ph.D., Professor (*Civil Engineering; Land, Air and Water Resources*)

Kandiah Arulanandan, Ph.D., Professor

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Robert H. Burgy, M.S., Professor (*Civil Engineering; Land, Air and Water Resources*)

Daniel P. Y. Chang, Ph.D., Associate Professor

James A. Cheney, Ph.D., Professor

Yannis F. Dafalias, Ph.D., Associate Professor

Otto J. Helweg, Ph.D., Associate Professor

^{2,3}Leonard R. Herrmann, Ph.D., Professor

Robert W. Hinks, Ph.D., Visiting Assistant Professor

James R. Hutchinson, Ph.D., Professor

William K. Johnson, M.S., Lecturer

Ryuichi Kitamura, Ph.D., Assistant Professor

Ray B. Krone, Ph.D., Professor

Tenny N. Lam, D.Eng., Professor

Bruce E. Larock, Ph.D., Professor

²James N. Luthin, Ph.D., Professor (*Civil Engineering; Land, Air and Water Resources*)

Miguel A. Mariño, Ph.D., Associate Professor (*Civil Engineering; Land, Air and Water Resources*)

Gerald T. Orlob, Ph.D., Professor

Otto G. Raabe, Ph.D., Adjunct Associate Professor (*Civil Engineering; Radiobiology Laboratory*)

Melvin R. Ramey, Ph.D., Professor

Karl M. Romstad, Ph.D., Professor

^{2,3}Edward D. Schroeder, Ph.D., Professor

Verne H. Scott, Ph.D., Professor (*Civil Engineering; Land, Air and Water Resources*)

Chih-Kang Shen, Ph.D., Professor

Michael A. Taylor, Ph.D., Associate Professor

George Tchobanoglous, Ph.D., Professor

Courses in Engineering: Civil

Lower Division Courses

1. The Civil Engineer in Society (1) I. The Staff (Romstad 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. Tchobanoglous

Lecture—2 hours; laboratory—3 hours. Prerequisite: lower division standing in the College. 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.

92. Internship in Engineering (1-5) I, II, III. The Staff (Romstad in charge)

Work-learn experience. Prerequisite: lower division standing; approval of project prior to period of internship. Supervised work-study experience in civil engineering. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Romstad in charge)

Prerequisite: consent of instructor; restricted to lower division students. Group study of selected topics. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Romstad in charge)

Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

131A. Structural Analysis: Elastic (3) I, III. Romstad

Lecture—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). Elastic structural analysis of determinate and indeterminate trusses, beams and frames. Analysis by virtual work, moment distribution and matrix force and displacement methods.

131B. Structural Analysis: Inelastic (3) II. Romstad

Lecture—3 hours. Prerequisite: course 131A. Moment distribution, matrix formulation and computer solution of statically indeterminate structures in the elastic and plastic ranges; influence lines.

132A. Structural Design: Metallic Elements (3) II, III. Ramey

Lecture—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). Metallic beams, columns, other members; analysis and design of riveted, bolted, and welded joints; design of simple beam connections, moment resistant connections, and column base plates.

132B. Structural Design: Concrete Elements (3) I, III. Taylor

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). 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.

134. Analysis and Design of Buildings (3) I, Taylor

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.

135. Aerospace Structures (3) III. Cheney

Lecture—3 hours. Prerequisite: Engineering 104B. Analysis of stiffened and unstiffened shell structures. Analysis of statically indeterminate box beams, rings and arches. Buckling of flat plates and shells.

137. Construction Principles (3) III. The Staff (Romstad 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) II. Romstad

Lecture—3 hours. Prerequisite: course 131A; Engineering 102A. 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. Taylor

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.

141. Engineering Hydraulics (3) I, III. Larock

Lecture—3 hours. Prerequisite: Engineering 103A. The nature of flow of a real fluid: boundary layer, separation, compressibility effects. Flow in pipes. Turbomachinery. Open channel flow.

141L. Engineering Hydraulics Laboratory (1) I, III. Larock

Laboratory—3 hours. Prerequisite: course 141 (may be taken concurrently). Laboratory experiments and demonstrations on flow measurement, sluice gates, hydraulic jump, flow characteristics, and centrifugal pumps.

142. Engineering Hydrology (3) I, II. Oriob

Lecture—3 hours. Prerequisite: course 141 (may be taken concurrently). Study of the hydrologic cycle. Analysis of precipitation processes. Hydrologic mechanisms. Streamflow. Flood routing. Groundwater. Stochastic processes in hydrology. Hydrologic design of engineering systems.

143. Water Resources Planning and Development (3) II. Scott

Lecture—3 hours. Prerequisite: course 142 recommended. Concepts and technical aspects affecting the planning, development, design, and operation of multipurpose projects. Consideration of policies; legislation; institutions; laws; public participation; water sources; quality data, and uses; economics; environmental concerns; and methodology.

144. Groundwater Systems Design (3) I, Mariño

Lecture—3 hours. Prerequisite: course 142 (may be taken concurrently). Groundwater occurrence, distribution, and exploration. Well-flow systems. Design of wells. Aquifer management, safe yield and overdraft. Conjunctive use of surface water and groundwater. Artificial recharge. Groundwater quality and contamination.

145. Hydraulic Systems Design (3) III. Amorochio

Lecture—3 hours. Prerequisite: courses 141, 141L, 142. Principles of project planning. Methods of analysis and hydraulic design of storage systems; diversion structures; conveyance and regulation systems; structures for irrigation, power, and flood control projects; pipeline networks; water connection systems.

146. Water Resources Systems Engineering (3) III. Helweg

Lecture—3 hours. Prerequisite: course 142; course 153 and either 144 or 145 recommended. Introduction to system analysis. Application of systems analysis techniques in the design of large-scale water projects. Use of computer simulation and optimization in real-world applications.

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: course 142. 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. Air Pollution Control (3) II. Chang

Lecture—3 hours. Prerequisite: Engineering 103A and 105A, or the equivalent. Sources of pollutants. Elements of meteorology and plume dispersion. Principles of particulate, gas, and vapor control devices. Internal combustion engine and alternatives. Basic photochemistry.

149L. Air Pollution Measurements: Fundamentals and Applications (2) II. Chang

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 149 (may be taken concurrently). Introduction to the principles and methods employed in ambient air quality measurements and source sampling.

150. Airborne Particles (3) III. Raabe

Lecture—3 hours. Prerequisite: Chemistry 1B, Mathematics 22B, and Physics 8B, or the equivalent. Recommended: Engineering 103A and 105A. Aerosol behavior, small-particle technology, and related inhalation toxicology are presented with emphasis on aerosol research and applied problems with small particles and droplets. Topics include aerosol mechanics, particle diffusion, aerosol generation, sampling, characterization and particle size analysis.

150L. Airborne Particles Laboratory (1) III. Raabe

Laboratory—3 hours. Prerequisite: course 150 (may be taken concurrently). This laboratory course provides practical application of principles and methods studied in course 150.

152. Introduction to Civil Engineering Planning (3) I. Helweg

Lecture—3 hours. Prerequisite: consent of instructor for non-engineering students. 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. Analytical Methods in Planning (3) I, II. Helweg

Lecture—3 hours. Prerequisite: Mathematics 22B. Introduction to operations research. Optimization techniques such as linear programming, dynamic programming, and non-linear programming. Introduction to multiple linear regression, time series analysis, and simulation. Applications, in water resources planning, transportation planning, systems engineering, and other civil engineering disciplines.

160. Introduction to Transportation Planning (3) II. Tardiff

Lecture—3 hours. Prerequisite: courses 10 and 152 or consent of the instructor. Study of the transportation planning process. Topics include the nature and history of transportation problems, transportation information systems, models, and evaluation methods. Alternative solutions to transportation problems are considered.

161. Transportation Systems Engineering (3) I. Kitamura

Lecture—3 hours. Prerequisite: course 10, Engineering 102A. Planning, design, and operation of transportation systems. Introduction to systems engineering and modeling. Characteristics of transportation systems. Conceptual design and functional operation of multi-modal systems.

162. Transportation Facilities Design (3) III. Lam

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 10 and 171. Geometric and structural design of transportation facilities. Alignment design of travelways. Capacity and functional design of travelways and terminals. Pavement design and construction. Economic and other design considerations.

171. Soil Mechanics (3) I, III. Arulanandan

Lecture—3 hours. Prerequisite: Engineering 104A (may be taken concurrently). Soil formations, mass-volume relationships, principle of effective stress, soil characteristics (classification and identification), compaction, capillarity and permeability, compressibility and consolidation, strength—state of stress and failure criteria.

172. Soil Properties, Soil Behavior, and Engineering Applications (2) I, III. Shen

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 171 (may be taken concurrently). Laboratory studies of physical, mechanical and hydraulic properties of soils and the use of these properties to predict the soil behavior in engineering investigation of geotechnical problems.

173. Foundation Design (4) II. Shen

Lecture—4 hours. Prerequisite: courses 132B and 171. Theory of consolidation and its application to foundation design; methods of minimizing settlements and effect of settlement on structures; bearing capacity of soils; footing design; lateral earth pressures; retaining-wall design; pile and pile foundation.

175. Introduction to Geological Engineering (3) III. Shen, Matthews

Lecture—2 hours; laboratory—3 hours. Prerequisite: junior standing in civil engineering, geology, and related fields with consent of instructor. Introduction to the principles of geology, and the study of geologic features affecting engineering structures. Discussion of geological aspects of engineering construction problems by means of case history studies. (Same course as Geology 175.)

177. Soil-Water Dynamics Laboratory (2) III. Cheney

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 171. Laboratory experiments in current research areas in soil dynamics. Topics to vary from year to year. Examples: excavation by explosives, impact penetration in soft soils, simulated earthquakes in centrifuge models, seepage erosion in soil.

189A-J. Selected Topics in Civil Engineering (1-5) I, II, III. The Staff (Romstad in charge)
Instruction may be carried out by lecture or laboratory, or by a combination of these two. Prerequisite: consent of instructor. Directed group study of selected topics with separate sections in (A) Environment 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.

192. Internship in Engineering (1-5) I, II, III. The Staff (Romstad in charge)
Prerequisite: upper division standing; approval of project prior to the period of the internship. Supervised work-study experience in civil engineering. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Romstad in charge)
Instruction in these variable-unit courses may be carried out by lecture or by laboratory, or by a combination of these two. 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 (Romstad 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 (3) I, Hutchinson
Lecture—3 hours. 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, Brush
Lecture—3 hours. Prerequisite: course 201. Analysis of the buckling behavior of structural members: flexural and torsional buckling of columns, lateral buckling of beams, non-linear bending and lateral-torsional buckling of beam-columns, stability of structural frames, buckling strength and ultimate strength of plates.

203. Inelastic Behavior of Solids: Plasticity (3) III, Dafalias
Lecture—3 hours. Prerequisite: course 201. Fundamentals of plasticity, the concept of yield, strain-hardening and the associated constitutive equations for elastic-plastic solids. Solution of selected practical problems involving elastic-plastic, strain-hardening materials. Slip line field theory and limit analysis. Offered in odd-numbered years.

204. Inelastic Behavior of Solids: Viscoelasticity (3) III, Dafalias
Lecture—3 hours. Prerequisite: course 201. Fundamentals of the theory of viscoelasticity for solids, representation of linear viscoelastic behavior in integral operator and complex moduli forms; characterization of engineering materials, e.g., metals, concrete, soil, asphalts, rubbers, etc. General analysis procedures for problems in viscoelasticity; solution of selected problems. Offered in even-numbered years.

205. Continuum Mechanics (3) I, Dafalias
Lecture—3 hours. Prerequisite: course 203 or 204. Tensor formulation of the field equations for continuum mechanics, including large deformation effects. Introduction to non-linear elasticity and viscoelasticity. Solution of three-dimensional problems. Offered in even-numbered years.

206. Buckling of Shells (3) I, Brush
Lecture—3 hours. Prerequisite: courses 202 and 221. Continuation of course 202. Initial-instability and post-buckling analysis of cylindrical shells and of shells of revolution. Examination of the influence of initial imperfections. Offered in odd-numbered years.

211. Advanced Matrix Structural Analysis (3) I, Romstad
Lecture—3 hours. Prerequisite: course 131A. Analysis of indeterminate structures by displacement and force methods; development of large-capacity computer program for frames; treatment of tapered and curved members and semi-elastic connections; emphasis on efficient digital-computer solutions; introduction to matrix stability analysis and structural optimization.

212A. Finite Element Procedures in Applied Mechanics (3) II, Herrmann
Lecture—3 hours. Prerequisite: Applied Science 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 3-D problems, and other approximation procedures.

212B. Finite Elements: Application to Structural Mechanics Problems (2) III, Herrmann
Lecture—2 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 problems.

212C. Finite Elements: Application to Fluid Problems (2) III, Larock
Lecture—2 hours. Prerequisite: courses 141, 212A, or the equivalent. 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.

213. Analysis of Structures Subjected to Dynamic Loads (3) III, Romstad
Lecture—3 hours. Prerequisite: courses 138, 211. Analysis of earthquake, blast and wind resistant structures. Distributed, consistent, and lumped mass techniques. Solution by direct numerical integration and normal mode integration. Solution of complex systems using the computer. Current research on earthquake effects. Offered in even-numbered years.

221. Theory of Plates and Shells (4) I, Herrmann
Lecture—4 hours. Prerequisite: course 201 (may be taken concurrently). Development of plate bending theory, including orthotropic behavior; application to transversely loaded, circular, and rectangular plates. Equivalent orthotropic properties for reinforced concrete, rib and waffle slabs. Introduction to folded plate theory. Development of general shell membrane theory and cylindrical shell bending theory. Discussion of approximate analysis procedures.

222. Design of Concrete Folded Plates and Shells (3) II, Ramey
Lecture—3 hours. Prerequisite: course 221. Current methods used in the design of folded plate and thin shell concrete structures. Topics include the design of spherical domes, conical shells, shells of translation, cylindrical shells and folded plate roofs. Offered in odd-numbered years.

223. Advanced Analysis of Plates and Shells (3) III, Brush
Lecture—3 hours. Prerequisite: course 221. Theory of thin elastic shells of general shape. Application to static, dynamic, and stability analyses of plates, cylindrical shells, and shells of revolution. Offered in odd-numbered years.

232. Advanced Topics in Concrete Structures (3) II, Taylor
Lecture—3 hours. Prerequisite: course 132B. Ductility of reinforced concrete. Torsion of structural concrete members, yield line theory for slabs, effects of shrinkage, creep and temperature. Continuity, precasting and connection details. Computer-aided analysis.

233. Advanced Design of Steel and Concrete Structures (3) III, Ramey
Lecture—3 hours. Prerequisite: courses 132A, 132B, 202. Design considerations for column and frame buckling; design for combined bi-axial bending and axial loading of concrete compression members; steel-plate girder design; steel-concrete composite design.

240. Water Quality (3) II, Orlob
Lecture—3 hours. Prerequisite: course 141. Water quality requirements for domestic, industrial, and recreational and wildlife water uses; properties of natural surface and groundwater; transport and fates of waterborne pollutants; methods of analysis.

241. Land Quality (3) I, Krone
Lecture—3 hours. Prerequisite: consent of instructor. Factors determining land quality for use in man's activities; land modification for temperature control, out-of-doors noise and its control; interrelations of land and vegetation on qualities of air and water.

242. Air Quality (3) III, Chang
Lecture—3 hours. Prerequisite: Engineering 105A, courses 141 and 149 or the equivalent. Factors determining air quality. Origins and fate of atmospheric pollutants. Effects of air pollutants. Physical and chemical fundamentals of atmospheric transport and reaction.

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 or consent of instructor. Continuation of course 243A.

244. Environment Quality Management (2) III, Orlob, Krone
Lecture—2 hours. Prerequisite: courses 240, 241; 242 (may be taken concurrently). Fates of pollutants in the overall environment; requirements for environment quality; monitoring methods; environment quality control methods.

245. Applied Aqueous-Solution Chemistry (3) I, Chang
Lecture—3 hours. Prerequisite: Engineering 105A, Chemistry 1A, 1B or the equivalent; Chemistry 5 and/or Chemistry 107A recommended. Chemical principles underlying cur-

rent practices in the examination and treatment of aqueous systems. Topics include: chemical equilibrium, redox reactions, surface chemistry. Offered in odd-numbered years.

245L. Applied Aqueous-Solution Chemistry Laboratory (1) I, Chang
Laboratory—3 hours. Prerequisite: Chemistry 1A and 1B or the equivalent; course 245 or Chemistry 5 recommended. Introduction to laboratory practice in the examination of water and wastewater. "Wet chemical" and instrumental techniques.

246A. Pilot Plant Laboratory: Physical Chemical Processes (2) II, Tchobanoglous
Laboratory—6 hours. Prerequisite: course 243A or consent of instructor. Laboratory investigation of physical and chemical processes for water and wastewater treatment.

246B. Pilot Plant Laboratory: Biological Processes (2) III, Tchobanoglous
Laboratory—6 hours. Prerequisite: course 243B or consent of instructor. Study of selected biological systems used in wastewater management.

250. Transportation Policy Planning (3) II, Lam
Lecture—3 hours. Prerequisite: course 152; course 160 (may be taken concurrently). Socio-technical nature of transportation. The societal, technical, and system bases for planning transportation developments. Policy framework of transportation developments and characteristics of planning process. Development of objectives, policy alternatives, and programs and factors and considerations involved in evaluations and decisions. Offered in odd-numbered years.

251. Transportation Planning Models (3) II, Kitamura
Lecture—3 hours. Prerequisite: course 160. Detailed study and discussions of quantitative models of urban passenger transportation including trip generation, modal split, trip distribution, network assignment, and direct demand models. Brief discussions of land-use models and freight transportation. Offered in even-numbered years.

252. Evaluation of Transportation Alternatives (3) III, Lam
Lecture—3 hours. Prerequisite: Environmental Studies 168A or the equivalent. Study of theory and practice of transportation evaluation. Topics include transportation economics, pricing, theoretical and applied transportation evaluation techniques, and use of citizen participation in transportation evaluation. Offered in even-numbered years.

254. Transportation Attitudes and Behavior (3) III, Lam
Lecture—3 hours. Prerequisite: course 160. Study of individual and household travel decisions. Emphasis is on conceptual and statistical issues involved in the specification of mathematical models of travel behavior. Objective and attitudinal explanations of travel behavior are considered. Planning applications are explored. Offered in odd-numbered years.

255. Characteristics of Transportation Systems (3) I, Lam
Lecture—3 hours. Prerequisite: course 161 or consent of instructor. Technological, service quality, and operational characteristics of transportation systems. Definition and quantification of variables important to planning and systems design. Nature and principles influencing system characteristics. Introduction to methods of analyzing transportation systems. Offered in even-numbered years.

256. Transportation Impact Assessment (3) I, Kitamura
Lecture—3 hours. Prerequisite: course 160. Discussions, readings, and quantitative analysis of the impacts of transportation systems on society. Topics include urban land use, regional development, environmental quality, and energy consumption. Offered in odd-numbered years.

257. Operations of Transportation Systems (3) III, Kitamura
Lecture—3 hours. Prerequisite: course 161. Stochastic modeling of transportation systems and analysis of system operations. Detailed study of system components including vehicle movements, terminals, and control subsystems. Application of mathematical tools to designing efficient system operations for various modes of transportation. Offered in odd-numbered years.

258. Transportation Networks (3) III, Lam
Lecture—3 hours. Prerequisite: course 153. Mathematical abstraction of transportation systems. Network flow analysis. System performance of a transportation network. Optimization problems of network design and network flow. Continuum treatment of transportation networks. Offered in even-numbered years.

260. Noncohesive Sediment Transportation (3) II, Krone
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 odd-numbered years.

261. Cohesive Particle Transportation (3) III. Krone
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 even-numbered years.

268. Economics of Water Resources Planning (3) I. Helweg
Lecture—3 hours. Prerequisite: Engineering 106 or Agricultural Economics 148; course 152 and Economics 1A recommended. The value of water and evaluation of project alternatives. The uniqueness of water in microeconomic theory. The relation of traditional methods such as benefit cost analysis to multiobjective optimization and utility theory in evaluating non-commensurable objectives.

270. Advanced Water Resources Planning (3) II. Helweg
Lecture—3 hours. Prerequisite: courses 142, 152, and 153 (may be taken concurrently) or consent of instructor. Philosophy and history of planning. Descriptive structure of plans and procedures to formulate plans. Advanced topics in institutional analysis, decision theory, data management, value theory and mathematical modeling.

270L. Water Resources Planning Laboratory (3) III. Helweg, Johnson
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 270. Application of hydrology, hydraulics, economics, systems analysis and planning in conducting a water resources planning study for water supply, water recreation, flood control, water quality and urban renewal. Lectures provide background and guidance to utilize computer models and advanced planning techniques for class project.

272. Groundwater Flow and Seepage (3) II. Luthin
Lecture—3 hours. Prerequisite: course 144, Mathematics 120; or consent of instructor. Flow of fluids through porous media. Anisotropy. Solution of steady/state problems by: mathematical analysis, models, analogs, graphical methods. Dupuit-Forchheimer assumptions. Method of images. Boussinesq's equation for transient problems, solution by Laplace transform. Seepage under dams. Offered in odd-numbered years.

273. Analysis of Groundwater Systems (3) I. Mariño
Lecture—3 hours. Prerequisite: course 144 or the equivalent; Mathematics 120 recommended. Groundwater motion theory and applications. Analysis of transient groundwater flow problems including flow to fully- and partially-penetrating wells, unconfined, nonleaky and leaky artesian aquifers. Multiple well systems. Identification of aquifer parameters. Artificial recharge, spreading basins, recharging wells. Offered in odd-numbered years.

274. Hydraulics of Pipe Lines (3) I, Larock
Lecture—3 hours. Prerequisite: course 141; Engineering 5 or the equivalent. Mechanics of liquid flow in pipes and pipe network systems. Steady flow, unsteady flow, surge and water-hammer problems. Introduction to stability and resonance phenomena. Offered in odd-numbered years.

275. Stochastic Hydrology (3) III. Amorcho
Lecture—3 hours. Prerequisite: course 142 or Water Science 141 or the equivalent. Application of modern statistical analysis in hydrology: time series analysis, stochastic models, simulation by Monte Carlo methods, statistical assessment of predictive capacity of models.

276. Hydrologic Systems Analysis (3) II. Amorcho
Lecture—3 hours. Prerequisite: course 142 or Water Science 141 or the equivalent; Mathematics 21C, 22A, 22B, 22C. Theory and application of the methods of modern systems analysis and mathematical statistics to problems of hydrological prediction. Emphasis on current developments in parametric and stochastic hydrologies.

277. Unsteady Flow in Open Channels (3) III. The Staff (Romstad in charge)
Lecture—3 hours. Prerequisite: course 141. Long waves in open-channel systems; Saint-Venant equations; method of characteristics; explicit and implicit finite-difference solutions, stability of numerical schemes, double-sweep method; influence of hydraulic structures; flood routing; bores; dam break; long waves in two-space dimensions.

277L. Computer Laboratory in Water Waves (1) III. The Staff (Romstad in charge)
Laboratory—1 hour. Prerequisite: course 277 (may be taken concurrently); a short course in Fortran programming. Development of computer programming for computing long waves in open channels. Explicit and implicit schemes, hydraulic bores, computation of catastrophic, dam-break floods.

278. Hydrodynamics (3) II. Larock
Lecture—3 hours. Prerequisite: Mathematics 120 or 185A; course 141 or the equivalent. Equations for conservation of mass, momentum, energy. Vorticity, circulation. Stream

function, velocity potential. Flows by superposition and conformal mapping. Free streamline applications, gravity effects, introduction to wave motion. Offered in odd-numbered years.

279. Advanced Mechanics of Fluids (4) I, Larock
Lecture—4 hours. Prerequisite: course 141 and Mathematics 21C. Rotational flows. Navier-Stokes equations and solutions for laminar, viscous flow; boundary layer equations and solution techniques. Nature of turbulence, statistical and phenomenological characterizations. Reynolds equations; isotropy simplification. Offered in even-numbered years.

281. Advanced Soil Mechanics (3) I, Arulanandan
Lecture—3 hours. Prerequisite: course 171. Consolidation, shear strength and analysis of slope stability problems.

282. Advanced Soil Mechanics Laboratory (3) II. Shen
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 281. Subsurface exploration, advanced laboratory techniques including consolidation, shear strength, pore water pressure measurement, pavement design tests, *in situ* tests. Offered in even-numbered years.

283. Physicochemical Properties of Soils and Soil Behavior (3) I, Arulanandan
Lecture—3 hours. Prerequisite: course 171. Analysis of the mechanical behavior of soils from consideration of clay mineralogy, colloidal phenomena, ion-exchange and soil-water characteristics. Conduction phenomena, deformation mechanisms, strength, swelling, compaction and erosion. Microscopic theories to explain yielding of soils.

284. Theoretical Soil Mechanics (3) II. Cheney
Lecture—3 hours. Prerequisite: course 171. Unified theory of stress-strain behavior of soil, consolidation and rate of settlement, interpretation of laboratory tests, drained and undrained strength of soil, anisotropy, and time dependent behavior.

285. Pavement Design and Soil Stabilization (3) II. Shen
Lecture—3 hours. Prerequisite: course 171. Principles and methods of pavement design for highway and airport pavements; purposes, principles and methods of soil stabilization in foundation engineering. Offered in odd-numbered years.

286. Advanced Foundation Design (3) III. Shen
Lecture—3 hours. Prerequisite: course 173. Design and analysis of bulkheads; deep excavation; tie-back systems; tunnelling in soft ground; loads on buried conduits; lateral pile loading capacity; pier foundations; additional topics of footing and raft design.

287. Dynamic Response of Soils (3) III. Arulanandan
Lecture—3 hours. Prerequisite: course 171. Seismic survey, dynamic soil properties, analysis of the behavior of soils under earthquake conditions; applications to liquefaction, seismic response of soil deposits; earth dams and other structures.

289A-J. Selected Topics in Civil Engineering (1-5) I, II, III. The Staff (Romstad in charge)
Instruction in these variable-unit courses may be carried out by lecture or by laboratory or by a combination of these two. Prerequisite: consent of instructor. Directed group study of special topics with separate sections in (A) Environment 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.

290. Seminar (1) I, II, III. The Staff (Romstad 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.)

298. Group Study (1-5) I, II, III. The Staff (Romstad in charge)
Instruction in these variable-unit courses may be carried out by lecture or by laboratory or by a combination of these two. Prerequisite: consent of instructor. Group study of selected topics. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Romstad in charge)
(S/U grading only.)

Engineering: Electrical and Computer

(College of Engineering)

V. Ralph Algazi, Ph.D., Chairperson of the Department

Department Office, 3118 Bainer Hall (752-0583)

Faculty

V. Ralph Algazi, Ph.D., Professor
George R. Branner, Ph.D., Associate Professor
John N. Churchill, Ph.D., Associate Professor
^{2,3}K. Wayne Current, Ph.D., Associate Professor
Andrew J. Dienes, Ph.D., Professor
¹Richard C. Dorf, Ph.D., Professor
Herman J. Fink, Ph.D., Professor
Leonard Forbes, Ph.D., Associate Professor
Gary E. Ford, Ph.D., Assistant Professor
²William A. Gardner, Ph.D., Associate Professor
³Tien C. Hsia, Ph.D., Professor
²A. K. Jain, Ph.D., Professor
William G. Lane, Ph.D., Lecturer
Wen C. Lin, Ph.D., Professor
Herschel H. Loomis, Jr., Ph.D., Professor
Earle W. Owen, D.Eng. Sci., Associate Professor
John B. Powers, Ph.D., Professor Emeritus
Robert J. Smith II, Ph.D., Lecturer
Michael A. Soderstrand, Ph.D., Associate Professor
Ronald F. Soohoo, Ph.D., Professor
Richard F. Walters, Ph.D., Professor

Courses in Engineering: Electrical and Computer

Lower Division Courses

1. Introduction to Electrical and Computer Engineering (1) III. The Staff (Algazi 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. A presentation of basic ideas and their applications. Examination of some case studies. (P/NP grading only.)

92. Internship in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Algazi in charge)
Work-learn experience—3-15 hours. Prerequisite: lower division standing; project approval prior to period of internship. Supervised work-study 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 (Algazi in charge)
Prerequisite: consent of instructor; restricted to lower division students. Group study of selected topics. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Algazi in charge)
(P/NP grading only.)

Upper Division Courses

110. Electronic Circuits (4) III. Churchill, Current
Lecture—4 hours. Prerequisite: course 112, Engineering 100. Large and small signal device models; analysis and design of linear circuits, both discrete and integrated forms; analysis and design of nonlinear, digital and pulse circuits.

111. Electronic Circuits Laboratory (3) III. Forbes, Churchill, Current
Laboratory—9 hours. Prerequisite: course 110 (may be taken concurrently). Projects on the design, analysis and evaluation of elementary transistor circuits, amplifiers, operational amplifiers, feedback circuits and digital circuits.

112. Linear Systems and Circuits (4) II. Ford, Algazi
Lecture—4 hours. Prerequisite: Engineering 17. Characterization and analysis of linear systems and circuits. Time domain analysis by convolution techniques. Emphasis on

Engineering: Electrical and Computer

frequency domain techniques, including Laplace transform, Fourier transform and Fourier series, with applications to electrical circuits.

114A. Bipolar Integrated Circuit Applications (3) I, Forbes, Churchill, Current

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 110, 111. Analysis and design of bipolar monolithic integrated circuits emphasizing circuit and system aspects rather than fabrication.

114B. MOS Integrated Circuit Applications (3) II, Forbes, Churchill, Current

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 110, 111. Metal-oxide semiconductor (MOS) integrated circuits and applications, dynamic and static memory and logic circuits, large-scale integrated random logic, read-only memory (ROM), programmable read-only memory (PROM), random-access memory (RAM), and shift registers.

115A. Integrated Circuits Design Technology (3) I, Churchill, Current

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 140. Various phases of integrated circuit design and fabrication are considered. Laboratory projects are used to develop skills in the most important techniques of integrated circuit fabrication.

115B. Bipolar Integrated Circuits Design and Fabrication Laboratory (3) II, Churchill, Forbes

Discussion—1 hour; laboratory—6 hours. Prerequisite: courses 140 and 115A. Design fabrication and testing of bipolar and/or metal-oxide-semiconductor devices and integrated circuits. Typical projects might include operational amplifier, digital logic system, or simple feedback control systems. (P/NP grading only.)

130A. Introductory Electromagnetics (3) I, Dienes, Fink

Lecture—3 hours. Prerequisite: Mathematics 22B and 22C; Physics 8B strongly recommended. Static electric and magnetic fields; time-varying electromagnetics.

130B. Introductory Electromagnetics (3) I, Fink, Dienes

Lecture—3 hours. Prerequisite: course 130A and Engineering 17. Plane electromagnetic waves, transmission, reflection; transmission lines.

131A. Electromagnetic Fields and Waves (3) I, Fink, Dienes

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. Dielectric guides. Helix and slow-wave structures. Wave propagation in media with anisotropic permittivity and permeability.

131C. Electromagnetic Fields and Waves (3) III, Fink, Dienes

Lecture—3 hours. Prerequisite: course 131B or the equivalent. Resonant cavities; microwave network components; antennas; moving systems and space-time (special relativity).

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 (4) II, Branner

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 132A. Passive high-frequency device, analysis, design. Microwave circuit and filter design. Analysis and design of microwave transistor and tunnel diode amplifiers, antenna analysis and design to include thin linear, loop, cylindrical, waveguide and horn, and phased array antennas.

133. High-Frequency Laboratory (2) III, Branner, Dienes

Laboratory—6 hours. Prerequisite: course 131A or 132A, or consent of instructor. Steady-state and transient transmission line behavior, rudimentary experiments with waveguides and waveguide components; design of passive microwave components using stripline. Radiation into free space; analysis of wire, horn and reflector antennas.

134. Radar Systems and Signals (3) II, Branner

Lecture—3 hours. Prerequisite: course 112; course 160 strongly recommended. Introductory course on radar systems and signals. Emphasis on analysis of practical radar system configurations and signals. The prediction of radar range performance, accuracy and resolution is discussed for a number of radar classes including: pulse, cw and pulse doppler.

140. Fundamental Principles of Device Physics (3) II, Churchill

Lecture—4 hours. Prerequisite: Physics 8B and 8D. Semiconductor device fundamentals: equilibrium and non-equilibrium statistical mechanics, conductivity, diffusion, density of states, electrons and holes p-n junctions and bipolar transistors; magnetic device fundamentals; origin of magnetism, magnetic materials, devices.

145A. Solid-State Electronics (3) I, III, Churchill, Soohoo

Lecture—3 hours. Prerequisite: course 140. Electrical and optical properties of solid-state materials. Topics discussed include the band-theory of metals, semiconductors, and insulators with special emphasis on the parameters which are useful in the design of semiconductor devices.

145B. Solid-State Electronics (3) II, Churchill, Soohoo

Lecture—3 hours. Prerequisite: course 145A. Electrical properties and design of various semiconductor devices. Devices to be discussed include metal-semiconductor diodes, PN junction diodes, Bipolar transistors, Field-effect transistors, and bulk negative resistance devices.

145C. Solid-State Electronics (3) II, Churchill, Soohoo

Lecture—3 hours. Prerequisite: course 145A. Design of devices and their associated circuits utilizing the magnetic properties of solids. Devices studied include the ferrite core, ferrite isolator, magnetic media used in disk, tape and bubbles and masers and lasers.

148. Superconductivity (3) I, Fink

Lecture—3 hours. Prerequisite: course 130B or course 140 or the equivalent. Fundamental properties of superconductors of the first and second kind, London and Ginzburg-Landau theories, Josephson effects, applications and devices.

150. Instrumentation Systems (3) I, Owen

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 100. Analytical and design methods common to all instrumentation systems; dynamic response; transducers; signal conditioning.

151. Discrete Time Systems (3) I, Hsia, Ford

Lecture—3 hours. Prerequisite: course 112. Characterization, analysis, and design of discrete time systems. Difference equation models. Z-transform analysis methods. Introduction to digital filter design. Discrete and fast Fourier transforms.

157A. Control Systems (3) II, Hsia, Owen

Lecture—3 hours. Prerequisite: course 112. Design and analysis of closed loop automatic control systems. Examples are drawn from all engineering fields. The mathematical representation of systems; frequency, s-plane and state space methods; stability criteria.

157B. Control Systems (3) III, Hsia, Owen

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 157A. Introduction to nonlinear and sampled data systems. Applications of digital and analog computers.

160. Fourier Analysis and Modulation (3) III, Gardner, Ford

Lecture—3 hours. Prerequisite: course 112. Fourier analysis of signals. Applications to analysis and design of linear time invariant systems, and nonlinear and time varying circuits for filtering, sampling and modulation.

161. Signal Processing (3) II, Ford

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 151; Engineering 100. Design and implementation of analog and digital signal processing systems. Topics include: filtering, spectral analysis, function circuits, A/D and D/A conversion, and digital communication systems.

165. Data Communication (3) II, Gardner, Ford

Lecture—3 hours. Prerequisite: course 160, Engineering 118. Introduction to data communication systems. Analysis of effect of modulation on signal corruption by noise. Techniques for high speed digital data transmission. Introduction to Information theory.

170. Computer Structure and Assembly Language (4) I, II, Loomis, Lin

Lecture—3 hours; computer workshop—3 hours. Prerequisite: proficiency in at least one higher-level programming language. Introduction to computer architecture, machine language; assembly language; macros and conditional assembly; input-output programming, absolute and relocatable code; re-entrant code; assemblers and loaders.

171. Introduction to Computer Architecture (4) III, Loomis, Lin

Lecture—3 hours; discussion—1 hour. Prerequisite: course 170. Study of architectural features of several representative computers, large, mini and micro, including instruction format, addressing, details of instruction operation, input-output and interrupts. Study of microprogrammable machines.

172. Microcomputer-Based Systems (4) III, Lin

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 170, 176; course 177 (concurrently) recommended. Studies of different types of microcomputers;

comparison and selection of microprocessors for goal-oriented applications; system design procedures; peripheral chips; interface design; microcomputer system software; typical application-oriented design projects.

175. Computer Devices and Systems (3) III, Soohoo

Lecture—3 hours. Prerequisite: course 140 (may be taken concurrently). Essential elements of the computer and their interdependence. Characteristics of input and output devices, memories and CPU (central processing unit) including discussion of discs, cores, magnetic bubbles, CCD's (charge-coupled devices) and microprocessors.

176. Digital Systems I (4) II, Loomis, Ford

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 100. Introduction to digital system design, including computer arithmetic, combinational circuit design, sequential and asynchronous circuits and memory system design.

177. Digital Systems II (4) III, Lin, Ford

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 110, 176. Introduction to design of multi-input system controllers, use of MSI/LSI in controller design, design of programmable system controllers, use of A/D and D/A and common problems in system design such as noise.

180. Data Structures and Programming Techniques (4) II, The Staff (Algazi in charge)

Lecture—3 hours; programming practice workshop—3 hours. Prerequisite: course 170. Concept of data-type, arrays, records, set structures and their representation. Sequential file structures. Dynamic information structures: linear lists, tree structures. Hash techniques; recursive algorithms; sorting and searching.

181. Programming Languages and Compilers (3) III, The Staff (Algazi in charge)

Lecture—3 hours. Prerequisite: course 180. Programming language design and implementation: survey and comparison of various language features. Assemblers, macros, interpreters, compilers; methods for describing syntax; parsing techniques; code generation; code optimization.

182. Operating Systems (3) III, The Staff (Algazi in charge)

Lecture—3 hours. Prerequisite: course 180. Operating systems: batch, multi-programming, time-sharing. Major components of an operating system: input-output handling, resource management (memories, processors, and I/O devices), information management (file structures, security). Practice in the preparation of system modules.

183. File Systems (4) II, The Staff (Algazi in charge)

Lecture—3 hours; discussion—1 hour. Storage and retrieval of information. File organization: relational, B-tree, etc. File utilization; efficiency, security, integrity. File oriented languages. Introduction to database systems.

185. Database Systems (4) III, Chang

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 180. Integrated approach to the design of database systems: structural elements, design guidelines, accessing techniques.

189A-O. Special Topics in Electrical and Computer Engineering (1-5) I, II, III, The Staff (Algazi in charge)

Lecture and/or Laboratory. Prerequisite: consent of instructor. Special topics in (A) Biomedical Engineering; (B) Computer Science; (C) Programming Systems; (D) Digital Systems; (E) Communications; (F) Control Systems; (G) Signal Processing; (H) High-Frequency Phenomena and Devices; (I) Solid-State Devices and Physical Electronics; (J) Systems; (K) Circuits; (L) Computer Software; (M) Computer Hardware; (N) Microprocessing; (O) Electronics.

*191. Discrete Structures and their Applications (3) I, The Staff (Algazi in charge)

Lecture—3 hours. Prerequisite: three-quarter sequence of a lower division mathematics course; course 170. Discrete structures and applications to various areas of computer science; mathematical models and mathematical reasoning; sets, relations, functions; application to data structures; semigroups; monoids; groups; lattices; Boolean algebra. Their use in coding theory, computer design, automata theory and formal languages.

192. Internship in Electrical and Computer Engineering (1-5) I, II, III, The Staff (Algazi in charge)

Work-learn experience—3-15 hours. Prerequisite: completion of a minimum of 84 units; project approval prior to period of internship. Supervised work-study experience in electrical and computer engineering. May be repeated for credit. (P/NP grading only.)

195A. Electronic Instrumentation for Biology, Chemistry and Medicine (3) I, Owen

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 16A, 16B; freshman physics course. Electric circuits, amplifiers, operational amplifiers, transducers and transducer systems, differentiators and integrators, dynamic response. Emphasis is on the external characteristics of instruments and the errors inherent in measurement. Engineering majors cannot receive credit for this course.

***195B. Electronic Instrumentation for Biology, Chemistry and Medicine** (3) II. Owen

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 195A. Dynamic response, signal processing, electrical impedance, noise and interference, electrical safety, digital-to-analog conversion, and digital data processing. Engineering majors may not receive credit for this course.

198. Directed Group Study (1-5) I, II, III. The Staff (Algazi in charge)

Instruction in these variable-unit courses may be carried out by lecture or by laboratory or by a combination of these two. 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 (Algazi in charge)

(P/NP grading only.)

Graduate Courses**201. Optimization Techniques with Applications** (3) I, Hsia, Jain

Lecture—3 hours. Prerequisite: knowledge of FORTRAN programming and graduate status. Computer-aided optimization of single-variable and multi-variable functions with and without constraints. Preplanned and sequential search methods. Gradient methods. Linear and nonlinear programming. Typical applications in different disciplines. Offered in odd-numbered years.

202. Optimization of Dynamic Systems (3) III. Hsia
Lecture—3 hours. Prerequisite: course 212. Introduction to dynamic system optimization techniques with applications. Calculus of variations, maximum principle, dynamic programming. Applications to various optimization problems in system engineering. Offered in odd-numbered years.

204. Digital Processing of Signals (3) II. Algazi, Jain
Lecture—3 hours. Prerequisite: course 151. Theory and applications of digital processing of signals. Recursive and non-recursive digital filter design techniques, analysis of quantization effects. Homomorphic signal processing.

206. Digital Image Processing (3) II. Jain
Lecture—2 hours; laboratory—3 hours. Prerequisite: knowledge of FORTRAN; senior students with consent of instructor only. Mathematical representation of images, transform theory and applications, image enhancement and applications, data compression and techniques for digital image transmission and storage. Special topics dealing with applications and laboratory projects are also included.

207. Pattern Recognition and Classification (3) III. Ford
Lecture—3 hours. Prerequisite: Engineering 118 or the equivalent. Topics in statistical pattern recognition: Bayes decision theory; parameter estimation and supervised learning; non-parametric techniques; linear discriminant functions; unsupervised learning and clustering; feature extraction. Applications to image processing.

210A. Advanced Electronic Circuits (3) II. Current, Churchill
Lecture—3 hours. Prerequisite: courses 110, 111. In-depth analysis of linear amplifiers. Designs are undertaken using Bode analysis, compensation, and root locus techniques. Computer aided analysis is used extensively.

210B. Advanced Electronic Circuits (3) III. Current, Churchill
Lecture—3 hours. Prerequisite: courses 110, 111. Advanced topics in integrated and hybrid electronic circuits are considered from the literature. Trends in LSI and VLSI circuit techniques are examined. State-of-the-art Op. Amp. designs are evaluated.

212. System Analysis (4) I, Hsia
Lecture—4 hours. Prerequisite: courses 112, 151. Analysis of continuous-time and discrete-time linear systems; state space techniques introduced as the major methodology for system analysis.

214. Computer-Aided Circuit Analysis and Design (3) III. Current

Lecture—3 hours. Prerequisite: course 110. Network equation formulations; numerical techniques for ac, dc, and transient solutions for linear and nonlinear networks; sensitivities and automated design; device models; and practical design problems using SPICE.

215. Advanced Projects in IC Fabrication (3) III.
Discussion—1 hour; laboratory—6 hours. Prerequisite: course 115B. Individualized projects in the fabrication of analog or digital integrated circuits.

220. Network Synthesis (3) I, Soderstrand, Current
Lecture—3 hours. Prerequisite: course 112. An introduction to modern active and passive network synthesis techniques. Topics include: one- and two-port networks, realization procedures, and filter theory. Emphasis is on modern techniques which lead to doubly terminated reactance two-port synthesis.

221. Passive Filter Design (3) II. Soderstrand, Current
Lecture—3 hours. Prerequisite: course 220 or the equivalent. An introduction to the design of passive filters with lumped and distributed elements. Filter specification and design process, reactance transformations, approximation theory, passive filters with lumped elements, crystal and ceramic filters, mechanical filters, microwave filters.

222. Active Filter Design (3) III. Soderstrand, Current
Lecture—3 hours. Prerequisite: course 220 or the equivalent. An introduction to the design of active filters with lumped, distributed elements, and switches. Active filters with lumped RC networks, active distributed RC networks, switched filters, n-path filters.

226A. Quantum Electronics (3) I, Dienes, Fink
Lecture—3 hours. Prerequisite: courses 130B and 140 or the equivalent. Some basic concepts of quantum theory, density operator, Hamiltonian, and parity. Electric dipole transition; equation of motion of magnetic dipole; resonant processes, absorption, dispersion and saturation; transient behavior of electric dipole transitions, coupled amplitude equations and rate equations. Offered in even-numbered years.

226B. Quantum Electronics (3) II. Dienes, Fink
Lecture—3 hours. Prerequisite: course 226A. Lasers, masers: population inversion, threshold requirement, steady-state and transient behavior, Q-switching. Interaction between radiation and phonons. Offered in odd-numbered years.

***227A. Microwave Electronics** (3) I, Soohoo
Lecture—3 hours. Prerequisite: courses 130B and 140 or the equivalent. 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 odd-numbered years.

***227B. Microwave Electronics** (3) II. Soohoo
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 even-numbered years.

230A. Advanced Electromagnetic Theory (3) I, Dienes, Branner
Lecture—3 hours. Prerequisite: course 131C or the equivalent. The exact formulation of electromagnetic problems by using vector potentials and Green's functions. Applications of these techniques to radiation and transmission problems.

***230B. Advanced Electromagnetic Theory** (3) III. Dienes, Branner
Lecture—3 hours. Prerequisite: course 230A. Advanced topics in propagation such as propagation through anisotropic media, duct theory of propagation over the earth, ray tracing through the ionosphere. Offered in even-numbered years.

245A. Applied Solid-State Physics (3) I, Fink, Soohoo, Churchill
Lecture—3 hours. Prerequisite: course 145C or the equivalent. The physics of solids relevant to solid-state applications. Topics include classical statistics, band theory of solids, electric polarization, conductivity, and magnetism in solids.

245B. Applied Solid-State Physics (3) II. Churchill
Lecture—3 hours. Prerequisite: course 245A. Theory of semiconductors with application to transistors. Topics include electrons, holes, mobility, and transistor circuitry. Brief discussion of superconductivity and superconducting solenoids. Offered in odd-numbered years.

***245C. Applied Solid-State Physics** (3) III. Fink, Soohoo
Lecture—3 hours. Prerequisite: course 245A. Theory of magnetism in solids, with application to ferromagnetic devices and circuits. Topics include paramagnetism, ferromagnetism, magnetic resonance, and switching properties of individual magnetic elements and magnetic arrays. Offered in even-numbered years.

246. Advanced Semiconductor Devices (3) III. Churchill
Lecture—3 hours. Prerequisite: course 145B. Physical principles and characteristics of various semiconductor devices such as: Junction field effect transistor, Silicon controlled rectifier, metal-insulator-semiconductor diodes, insulated gate field effect transistors, thin film devices, optoelectronic devices, and charge-coupled devices.

***251. Nonlinear Control Systems** (3) III. Owen
Lecture—3 hours. Prerequisite: courses 157B and 212. Techniques for solving nonlinear control problems; state

space methods, stability theorems; Lyapunov's methods; sinusoidal describing function and on-off systems. Offered in even-numbered years.

253. Introduction to Adaptive Systems (3) I, Hsia
Lecture—3 hours. Prerequisite: course 151. An introduction to the theory and practice of adaptive systems. Concepts of learning and adaptation. Structure of adaptive system and the related optimization algorithms. Applications to adaptive signal prediction, noise cancellation, system identification control.

254. Digital and Sampled-Data Control Systems (3) II. Hsia
Lecture—3 hours. Prerequisite: courses 157B, 212 or the equivalent. Introducing major topics in digital and sampled data control system analysis and design. Three categories of design methodologies are presented: frequency domain (z-transform) methods, state space methods, and statistical design methods. Offered in even-numbered years.

270. Finite-State Machines (3) III. Loomis, Spillman
Lecture—3 hours. Prerequisite: course 191. A study of finite-state sequential machine models and behavior; experiments; the Regular Algebra; algebraic structures theory of finite-state machines; completeness of sets of primitives. Offered in odd-numbered years.

271. Advanced Digital System Design (4) III. Loomis, Lin
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 177. 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.

272. Advanced Switching Theory (3) III. The Staff (Algazi in charge)
Lecture—3 hours. Prerequisite: courses 171, 191. Topics in switching theory. Synchronous and asynchronous sequential circuits. Theoretical study of Boolean functions and their transforms. Special realization techniques for combinational and sequential circuits. Offered in even-numbered years.

273. Bit-Slice Microprocessor Systems (3) I, Lin
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 172. Literature search and comparison of most popular bit-slice microprocessors. Microprogramming based on Wilkes Model. Microprogram control technique and state machine concept for digital logic design. Machine emulation.

274. Advanced Computer Architecture (3) I, Loomis
Lecture—3 hours. Prerequisite: course 271 or consent of instructor. A study of computer architectures of advanced scientific computers. CDC 6000, 7000 series architecture. Iliac IV architecture. Pipeline array processor architecture. Offered in even-numbered years.

***276A. Introduction to Fault-Tolerant Computing** (3) I. The Staff (Algazi in charge)
Lecture—3 hours. Prerequisite: course 176. Examination of current issues in design and analysis of fault-tolerant digital systems. Course covers basic fault-tolerant architectures such as NMR, Hybrid, and Fail-Soft as well as reliability analysis, system diagnosis, and software fault-tolerance.

***276B. Introduction to Digital Fault Diagnosis** (3) II. The Staff (Algazi in charge)
Lecture—3 hours. Prerequisite: course 176; Engineering 118. 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.

277. Advanced Programming and Data Structures (3) II. The Staff (Algazi in charge)
Lecture—3 hours. Prerequisite: course 180; course 181 or 182 recommended. Formal specification of data structures; design and representation of data structures; elements of graph theory; general list structures; manipulation of list structures in LISP; memory management.

***278A. Formal Languages and Related Automata** (3) II. The Staff (Algazi in charge)
Lecture—3 hours. Prerequisite: course 191 or consent of instructor. Classes of formal languages and their grammars, important classes of finite and infinite automata and their properties. Correspondence between these classes and types of formal grammars. Emphasis on context-free languages.

278B. Translation of Programming Languages (3) II. The Staff (Algazi in charge)
Lecture—3 hours. Prerequisite: courses 180, 181 and 278A. Compilation process. Storage allocation. Object code generation. Boot strapping. Parsing techniques. Table-driven compilers. Optimization techniques.

***279. Artificial Intelligence** (3) II. The Staff (Algazi in charge)
Lecture—3 hours. Heuristic programming. Representation

Engineering: Mechanical

of knowledge. Problem solving methods. Game playing. Machine perception of three dimensional space. Theorem proving. Semantic information processing.

283. Random Signals and Noise (4) II. Gardner, Algazi
Lecture—3 hours; discussion—1 hour. Prerequisite: course 160 and Engineering 118 or the equivalent. Introduction to random processes with applications to optimum and adaptive filtering of signals in noise. Second order stochastic calculus. Correlation function, power spectral density, mean-ergodicity. Linear minimum-mean-squared-error estimation, and stochastic approximation for smoothing, filtering, prediction, cancellation.

284. Estimation and Detection of Signals in Noise (3) III. Gardner, Algazi
Lecture—3 hours. Prerequisite: Engineering 118. Application of probabilistic and statistical methods and models to detection and estimation of signals in noise. Classical parameter estimation and decision theory. Extension of classical techniques for finite variables to continuous parameter processes. Application to estimation of signal parameters, detection of signals.

285. Information Theory and Coding (3) III. Algazi, Gardner
Lecture—3 hours. Prerequisite: Engineering 118 or the equivalent. Information theory and coding. Measure of information. Redundancy reduction encoding of an information source. Capacity of a communication channel, error-free communication. Linear block and convolutional codes.

***286. Random Signals and Noise, II** (4) I. Gardner
Lecture—3 hours; discussion—1 hour. Prerequisite: course 283. Continuation of 283 with application to modeling, recursive filtering, and spectral estimation. Analysis of Gaussian processes and filtered Poisson processes. Markov processes and recursive filtering. Least squares autoregressive modeling. Spectral estimation.

289A-O. Special Topics in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Algazi in charge)
Lecture and/or laboratory. Prerequisite: consent of instructor. Special topics in (A) Biomedical Engineering; (B) Computer Science; (C) Programming Systems; (D) Digital Systems; (E) Communications; (F) Control Systems; (G) Signal Processing; (H) High-Frequency Phenomena and Devices; (I) Solid-State Devices and Physical Electronics; (J) Systems; (K) Circuits; (L) Computer Software; (M) Computer Hardware; (N) Microprocessing; (O) Electronics.

290. Seminar (1) I, II, III. The Staff (Algazi in charge)
Seminar—1 hour. Discussion and presentation of current research and development. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Algazi in charge)
Instruction in these variable-unit courses may be carried out by lecture or by laboratory or by a combination of these two. Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Algazi in charge)
(S/U grading only.)

John D. Kemper, Ph.D., Professor
Donald L. Margolis, Ph.D., Associate Professor
Allan A. McKillop, Ph.D., Professor
Paul G. Migliore, Ph.D., Assistant Professor
Paul S. Moller, Ph.D., Lecturer
Bruce R. White, Ph.D., Assistant Professor
An Tzu Yang, D.E.Sc., Professor
Marvin F. Young, Ph.D., Lecturer

Division of Materials Science and Engineering

Faculty

David G. Howitt, Ph.D., Assistant Professor
Amiya K. Mukherjee, D.Phil., Professor
Zuhair A. Munir, Ph.D., Professor
James F. Shackelford, Ph.D., Associate Professor

Courses in Mechanical Engineering

Lower Division Courses

1. Mechanical Engineering (1) II. McKillop
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.)

92. Internship in Mechanical Engineering (1-5) I, II, III. The Staff (Beadle in charge)
Work-learn experience. Prerequisite: lower division standing; approval of project prior to period of internship. Supervised work-study experience in engineering. May be repeated for credit. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Beadle in charge)
Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

110. Fluid Mechanics (3) I, White
Lecture—3 hours. Prerequisite: Engineering 103B. Development of general equations of motion for viscous fluids; inviscid flow theory; viscous flow; thin shear flows; transition; turbulence; simple mixing theories of turbulence. Applications to turbomachinery, and airfoils.

124. Mechanical Engineering Projects (2) I, II, III. The Staff (Beadle in charge)
Laboratory—6 hours. Prerequisite: consent of instructor. Performance of projects which include design, development and evaluation of a mechanical engineering system or related experiments which give the student experience in theoretical modeling and experimental evaluation. May be repeated once for credit.

127. Aerodynamics of Lifting Surfaces (3) II. White
Lecture—3 hours. Prerequisite: course 110. Dimensional analysis and similitude. Review of basic potential flow. Thin airfoil theory, infinite wing theory, finite wing theory, the boundary layer, and three-dimensional effects. Drag and airfoil characteristics. Theory of propellers.

128A-128B. Vehicle Design (2-2) II-III. Migliore
Lecture—1 hour; discussion—1 hour. Prerequisite: Engineering 104B. Design of aeronautically related systems, including the influence of aerodynamic and inertial loading on structural integrity, stability, and control.

134. Vehicle Stability (4) III. Karnopp
Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 102B. Introduction to the static and dynamic stability characteristics of transportation vehicles with examples drawn from aircraft, high-performance automobiles and waterborne vehicles including hovercraft. Laboratory experiments illustrate response to various inputs such as gusts, surface roughness, and control deflections.

150A. Mechanical Design and Manufacturing Processes (4) I, III. Henderson
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). The principles of engineering mechanics applied to the fundamentals of mechanical design. Theories of static and fatigue failure of metals. Design projects emphasizing reduction of conceptual design to hardware. Manufacturing processes laboratory.

150B. Mechanical Design and Manufacturing Processes (3) I, II. The Staff (Beadle in charge)
Lecture—2 hours; Discussion—1 hour. Prerequisite: course

150A. Principles of engineering mechanics, failure theories and fatigue theory applied to the design and selection of mechanical components. Design projects which concentrate on conceptual design, engineering analysis, engineering drawing, methods of manufacture, material selection and cost.

151. Advanced Mechanical Design (3) II. Hull
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 150B (may be taken concurrently). Introduction to computer-aided design methods using finite element analysis, statistical design and reliability theory, and selected advanced analytical techniques in design.

152. Mechanism Design (3) I, Yang
Lecture—3 hours. Prerequisite: Engineering 102A. Application of complex-number method to kinematic, static and dynamic analyses of plane mechanism and dynamic balancing of mechanisms. Design of epicyclic gear trains and intermittent mechanisms. Introduction to kinematic synthesis of mechanisms for function generation, curve tracing and body guidance.

155. Engineering Systems Design (3) III. Henderson
Lecture—2 hours; discussion—1 hour. The engineering design process and its use; design projects; engineering case studies.

161. Gas Dynamics of Energy Systems (4) I, Hoffman
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B and 105B. Development of the basic methods needed to describe the compressible gas flow occurring in nozzles, engines and power generation systems. Analysis of the combustion processes occurring in various engine conversion processes with emphasis on chemical equilibrium and flame propagation.

162. Gas Turbine Power Plants (4) II. Hoffman
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B and 105B; course 161 strongly recommended. Study of gas turbine power plants for electric power generation, aircraft propulsion and other transportation applications. Gas dynamic and thermodynamic analysis of compressors, turbines and the other gas turbine components as well as complete power-plant cycle.

***163. Nuclear Reactor Engineering** (4) III. Baughn
Lecture—3 hours; discussion—1 hour. Prerequisite: course 165. Fundamentals of nuclear reactor theory, steady-state and kinetics. Fluid mechanics, heat transfer and thermodynamics of existing and future nuclear reactor types. Introduction to fusion power principles and prospects.

165. Fundamentals of Heat Transfer (3) II. Dwyer
Lecture—3 hours. Prerequisite: Engineering 103B and 105B. Fundamentals of conduction, convection and radiation heat transfer; applications to engineering equipment.

171. Analysis, Simulation, and Design of Dynamic Systems (4) I, II. Hubbard, Karnopp
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 102B and 180. Structural models for dynamic systems. Design of control systems to improve linearity, accuracy and speed of response. Design of feedback systems which maintain quality of performance in spite of parameter variations. Analog and digital computer simulation.

172. Analysis, Simulation, and Design of Feedback Systems (4) III. Hubbard
Lecture—3 hours; discussion—1 hour. Prerequisite: course 171. Phenomenological models for dynamic systems. Control system design using frequency domain methods. Stability of nonlinear control systems. Introduction to state space techniques.

176. Measurement Systems (3) II, III. Hull
Lecture—2 hours; discussion—1 hour; laboratory—1 hour. Prerequisite: Engineering 100 and 102A. Theory of measurements; measurement techniques for mechanical systems; transducers; data manipulation and processing; data digitization.

192. Internship in Engineering (1-5) I, II, III. The Staff (Beadle in charge)
Work-learn experience. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work-study experience in mechanical engineering. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Beadle in charge)
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 (Beadle 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 radia-

Engineering: Mechanical

(College of Engineering)

Charles W. Beadle, Ph.D., Chairperson of the Department

Department Office, 2020 Bainer Hall (752-0580)

Faculty

James W. Baughn, Ph.D., Associate Professor
Charles W. Beadle, Ph.D., Professor
Harry Brandt, Ph.D., Professor
John W. Brewer, Ph.D., Professor
Harry A. Dwyer, Ph.D., Professor
Clyne F. Garland, M.S., Professor Emeritus
Warren H. Giedt, Ph.D., Professor
John F. Gisia, J.D., Lecturer
Jerald M. Henderson, D.Eng., Professor (*Mechanical Engineering, Food Science and Technology*)
Myron A. Hoffman, Sc.D., Professor
Mont Hubbard, Ph.D., Assistant Professor
Mauri L. Hull, Ph.D., Assistant Professor
Dean C. Karnopp, Ph.D., Professor

tion. Gaseous radiation. Applications to solar energy systems.

208. Experimental Techniques in Fluid Mechanics and Heat Transfer (3) III. Baughn, McKillop
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 110 and 165, or 210A. Design of experiments in fluid mechanics and heat transfer. Uncertainty and statistical analysis of data. Steady and transient measurements of heat flux, temperature, pressure and flow rate. Mean and fluctuating velocity and temperature measurements of fluids with hot-wire anemometry.

210A. Fundamentals of Fluid Mechanics and Heat Transfer (4) I. Dwyer
Lecture—4 hours. Prerequisite: graduate standing or consent of instructor. Study of governing equations and numerical solving techniques for linearized convection. Solutions for irrotational flow, heat conduction and convection and viscous flow interactions. Analysis of turbulence, transport by Reynolds stresses, and Prandtl's mixing length hypothesis.

210B. Advanced Fluid Mechanics and Heat Transfer (4) II. McKillop
Lecture—4 hours. Prerequisite: course 210A. Analytical and numerical analysis of the Navier-Stokes and energy equations for steady, two dimensional flows. Numerical techniques in solving fluid flow problems; turbulent-transport modeling; boundary layers and flow stability. Other selected topics.

211. Fluid Flow and Heat Transfer Design (4) III. Hoffman
Lecture—3 hours; discussion—1 hour. Prerequisite: course 210A or consent of instructor. Design aspects of selected topics from: heat conduction, thermal stresses, fins; heat transport in ducts, boundary layers and separated flows; impingement and film cooling; heat exchangers; flow in diffusers, over airfoils and blades. Other selected topics.

212. Advanced Topics in Fluid Flow and Heat Transfer Design (3) II. Giedt
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. In-depth studies of advanced technology design problems in fluid mechanics and convective heat transfer. Each student will undertake a project. Offered in odd-numbered years.

213. Advanced Turbulence Modeling (3) III. The Staff (Beadle in charge)
Lecture—3 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 discretization, force fields; high order models. Offered in even-numbered years.

214. Advanced Numerical Fluid Mechanics (3) III. Dwyer
Lecture—3 hours. Prerequisite: course 210B. Development and solution of basic and advanced finite difference schemes for the Navier-Stokes equations, laminar and turbulent boundary layer equations, and the potential flow equations. Analysis of the stability and convergence of the methods with practical examples. Offered in odd-numbered years.

215. Gas Dynamics (3) I. White
Lecture—3 hours. Prerequisite: Engineering 103B, 105B. Derivation and analysis of the basic equations of motion of inviscid gases at subsonic and supersonic speeds. Prandtl-Meyer flow and the method of characteristics; applications to unsteady transonic and hypersonic flow; shock theory. Offered in even-numbered years.

216. Advanced Thermodynamics (3) I. Hoffman
Lecture—3 hours. 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.

217. Analysis of Reacting Flows (3) I, Dwyer
Lecture—3 hours. Prerequisite: course 210A and 216. Derivation and analysis of basic equations for chemically reacting flow systems. Calculation of high temperature gas properties and use of reaction rate models. Selected applications to both laminar and turbulent flame propagation in both steady and unsteady situations. Offered in odd-numbered years.

218. Advanced Energy Systems (4) III. Hoffman
Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing. Study of advanced power generation concepts, basic energy balances, component efficiencies and overall power plant efficiencies. Comparison of gas turbines, steam turbines and magnetohydrodynamic generators, as well as power plant concepts based on combustion nuclear fission and controlled thermonuclear fusion.

220A-220B. Mechanical Vibrations (3-3) II, III. Hubbard
Lecture—3 hours. Prerequisite: Engineering 122. Applica-

tions of vibration theory to systems with many degrees of freedom and continuous systems. Introduction to random vibrations.

222. Advanced Dynamics (3) I, Hubbard
Lecture—3 hours. Prerequisite: Engineering 102B. Dynamics of particles and of rigid bodies with advanced engineering applications; generalized coordinates; Hamilton's Principles; Lagrange's Equations; Hamilton-Jacobi theory.

224. Kinematic Design of Mechanisms (3) II. Yang
Lecture—3 hours. Prerequisite: course 152 or consent of instructor. Introduction to Bernoulli 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.

226. Acoustics and Noise Control (4) I, Karnopp
Lecture—3 hours; laboratory—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.

250. Engineering Case Studies (2) II. Henderson
Discussion—2 hours. Studies of selected problems which illustrate various methods of the design process and management in advanced mechanical engineering systems.

255. Computer-Aided Mechanical Design (3) III. Beadle
Lecture—2 hours; discussion—1 hour. Prerequisite: course 150B. The use of computer-based numerical methods including optimization techniques in mechanical design analysis and synthesis. Interactive computer-aided design.

270. Modeling and Simulation of Engineering Systems (3) I, Karnopp
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. Analysis and Control of Multivariable Systems (3) II. Karnopp
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—3 hours; computational laboratory—3 hours. Prerequisite: course 172 and graduate standing. Equal emphasis on manipulative (algebraic) and conceptual (geometric) skills. The theory of polynomials and matrices. Introduction to linear vector spaces. State space. Integral transforms. Controllability and observability. Multi-variable feedback control for pole placement. Direct digital control.

272B. Feedback Control and Estimation Theory (4) II. Brewer
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 270 and 272A. Equal emphasis on digital and analog multi-variable control. The theories of observers and filters. Synthesis of feedback systems. Decoupling control. Feedback to reduce sensitivity to parameter variation. Finite settling time systems. Introduction to optimum control.

273. Computer-Aided Design and Synthesis of Estimation and Control Systems (4) III. Brewer
Lecture—3 hours; computational laboratory—3 hours. Prerequisite: course 272B. The use of computers in the design or in the synthesis of multivariable feedback systems. Optimization and optimal control. Frequency domain and graphical methods. Offered in odd-numbered years.

276. Data Acquisition and Analysis (3) II. Hull
Lecture—2 hours; discussion—1 hour. Prerequisite: course 176. Principles of data acquisition with emphasis on digital techniques. Use of micro and minicomputers to control data acquisition process. Methods of data analysis including probability distributions, correlations, regression, and Fourier analysis. Special attention to digital spectral analysis.

280. Advanced Engineering Analysis (3) I, Brandt
Lecture—3 hours. Prerequisite: Engineering 180 or the equivalent. Applications in mechanical engineering or advanced analytical and numerical techniques. Topics include probability theory, calculus of variations, classification of differential equations, and advanced numerical methods.

290. Seminar (1) I, II, III. The Staff (Dwyer in charge)
Seminar—1 hour. (S/U grading only.)

295. Engineering Case Study Preparation (3) III. Henderson
Discussion—1 hour; laboratory—6 hours. Prerequisite: course 250. Preparation of case studies of selected ongoing or completed engineering projects from industry. (S/U grading only.)

297. Dynamic Systems and Control Theory (1) I, II, III. Karnopp, Hubbard
Seminar—1 hour. Prerequisite: consent of instructor. A 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 (Beadle in charge)

299. Research (1-12) I, II, III. The Staff (Beadle in charge)
(S/U grading only.)

Graduate Courses

(In the Division of Materials Science and Engineering). (Undergraduate courses in Materials Science and Engineering are listed on page 184 under Engineering core courses as Engineering 130 through 148, inclusively.)

240. Transport in Materials Processes (4) I, Munir
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 odd-numbered years.

241. Principles and Application of Dislocation Mechanics (4) II. Mukherjee
Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Engineering or consent of instructor; Engineering 148 recommended. Concepts of 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 even-numbered years.

242. Advanced Mechanical Properties of Materials (4) III. Mukherjee
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 148 or consent of instructor. 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 fracture, and creep. Influence of microstructure in optimizing the mechanical strength properties. Offered in odd-numbered years.

243. Kinetics of Phase Transformations in Engineering Materials (4) II. Mukherjee
Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Engineering or consent of instructor. Engineering 148 recommended. The theory of alloying, kinetics of phase changes, homogeneous and heterogeneous transformation, transformation by shear, order-disorder reactions and the phase changes during the heat treatment of iron-carbon alloys are discussed. Offered in odd-numbered years.

244. Interaction of Materials and their Environment (4) I, Munir
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 45, 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 even-numbered years.

245. Advanced Topics in Structure of Materials (4) III. Shackelford
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 132 and graduate standing in Engineering or consent of instructor; Engineering 142 and 148 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 radial distribution function of amorphous materials. Offered in even-numbered years.

246A. Fundamentals of Transmission Electron Microscopy (3) I, Howitt
Lecture—2 hours; discussion—1 hour. Prerequisite: consent of instructor; course 246L (concurrently). Principles and techniques of transmission electron microscopy used in study of materials will be described. Emphasis upon practical applications and a required laboratory session.

246L. Laboratory for Electron Microscopy (2) I, Howitt
Laboratory—6 hours. Prerequisite: course 246A (may be taken concurrently); consent of instructor. Practical ap-

NOTE: For key to footnote symbols, see page 130.

English

plication of techniques of electron microscopy. Preparation and observance of crystalline specimens, photographic recording, techniques and instrument alignment.

English

(College of Letters and Science)

Thomas A. Hanzo, Ph.D., Chairperson of the Department

Department Office, 114 Sproul Hall

Faculty

William E. Baker, Ph.D., Professor
 Kent Bimson, Ph.D., Visiting Lecturer
 William M. Byrd, Ph.D., Associate Professor
 Joan C. Carr, Ph.D., Assistant Professor
³Everett Carter, Ph.D., Professor
 Peter A. Dale, Ph.D., Assistant Professor
 Joanne Feit Diehl, Ph.D., Assistant Professor
 Elliot L. Gilbert, Ph.D., Professor
¹Sandra M. Gilbert, Ph.D., Associate Professor
 Thomas A. Hanzo, Ph.D., Professor
¹Wayne Harsh, Ph.D., Professor (*English, Linguistics*)
 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
 Elizabeth R. Homann, Ph.D., Associate Professor Emeritus
^{3,4}Robert H. Hopkins, Ph.D., Professor
 Richard A. Levin, Ph.D., Assistant Professor
 Arthur E. McGuinness, Ph.D., Professor
²Diane Johnson Murray, Ph.D., Professor
 Gwendolyn B. Needham, Ph.D., Professor Emeritus
³David A. Robertson, Ph.D., Associate Professor
 Winfried Schleiner, Ph.D., Associate Professor
 Gwendolyn Schwabe, M.A., Lecturer
 Karl J. Shapiro, Professor
²Daniel Silvia, Ph.D., Associate Professor
^{3,4}Brom Weber, Ph.D., Professor of American Literature
 Robert A. Wiggins, Ph.D., Professor
^{2,3}James L. Woodress, Ph.D., Professor
 Celeste T. Wright, Ph.D., Professor Emeritus
 Karl F. Zender, Ph.D., Assistant Professor

The Major Program

The study of English develops skills in reading analytically and perceptively and in writing clearly and with effect; thus it is a preparation for careers in writing, teaching, and editing, or for any role in which clear communication is important. The program offers its majors several options. A student majoring in English may elect the general study of English and/or American literature or may choose to emphasize (1) Linguistics, (2) Teaching, or (3) Writing.

English

A.B. Degree Requirements:

	UNITS
Preparatory Subject Matter	24
One course from English 1, 2, 3	4
English 45	4
English 30A, 30B, 46A, 46B	16
Depth Subject Matter (for each emphasis, see below)	40
Core requirement	20
One course from each of the following five groups	20
(a) British Literature to 1500: English 111, 112, 113A, 113B, 150A.	

- (b) Renaissance (1500-1660): English 116, 117A, 117B, 117C, 120, 122, 150B.
- (c) British Literature (1660-1800): English 123, 125, 127, 150C, 155A. American Literature (1620-1800): English 140, 141.
- (d) 19th Century (British or American): English 130, 132, 133, 134, 142, 143, 144, 155B, 155C, 158A.
- (e) 20th Century (British or American): English 136, 137, 138, 139, 146, 147, 150D, 152, 155D, 158B, 179, 181, 182, 183.

The above five courses must be selected so that three of the following categories are represented

- (a) Historical Period: English 111, 112, 116, 120, 123, 125, 127, 130, 132, 133, 134, 136, 137, 138, 139, 140, 141, 142, 143, 144, 146, 147.
- (b) Poetry: English 113A, 113B, 122, 160, 170A
- (c) Drama: English 117A, 117B, 117C, 150A, 150B, 150C, 150D, 152, 183.
- (d) Fiction: English 155A, 155B, 155C, 155D, 156, 158A, 158B.

The following courses—English 107, 110A, 110B, 171, 173, 174, 175, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 198, and 199—are designed for studying a special subject, one that may be fairly constant in format (as with English 110, 171, 173, 174, 175, 179, 180, 181, 182, 183, 184, 185, 186) or one that may vary each time the course is offered (as with English 107, 187, 188, 189, 198, 199). These special subject courses may satisfy core requirements and/or emphasis core requirements; in order to ascertain the applicability of one of these courses to the major, you should consult with an adviser.

General Major	
Depth Subject Matter	40
Core requirements (see above)	20
One course from language/linguistics group: English 105A, 105B, 105C, 105D, 107, 196	4
A seminar in student's area of emphasis selected from English 187, 188, 189, 196, or 198	4
Twelve elective units in upper division English courses	12
Total Units for the Major	64

Linguistics Emphasis	
Depth Subject Matter	40
Core requirement, same as for (General) major above	20
Four courses in Linguistics	16
One elective course	4
Total Units (Linguistics Emphasis)	64

Teaching Emphasis	
Depth Subject Matter	40
Core requirement, same as for (General) major above, but must include one course from English 117A, 117B, or 117C	20
Seminar in British or American literature: English 187, 188, or 189	4
English 103A-F, 105A, 105B	12
One of the following: English 179, 181, or an ethnic literature course from outside the English department	4
Total Units (Teaching Emphasis)	64

Writing Emphasis	
Depth Subject Matter	40
Core requirement, same as for (General) major above	20
One course from the language/linguistics group: English 105A, 105B, 105C, 105D, 107, 196	4
Twelve units in English 100F and/or 100P	12
English 198 (seminar in writing techniques) or 199 (writing)	4
Total Units (Writing Emphasis)	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	20
Five upper-division courses, four of which will be literature courses	20

Subject A. Students must have passed the Subject A requirement before taking any course in English.

Prerequisites. One course from 1, 2, 3 is required for admission into courses 30A, 30B, 30C, 43, 44, 45, 46A, 46B, 46C, 47, and all upper division courses. A course from courses 43, 44, and 45 is recommended as preparation for the 30 and 46 series.

Meeting for Majors. All English majors are required to attend a general meeting for majors at the beginning of each year; all new and transfer English majors are required to attend a general meeting for majors at the beginning of their first quarter in residence; all English majors must see their advisers, individually, in the spring quarters of their sophomore and junior years.

Major Advisers. W. E. Baker, W. M. Byrd, J. C. Carr, E. Carter, J.F. Diehl, E. L. Gilbert, J. O. Hayden, P. L. Hays, W. J. Hicks, R. A. Levin, A. E. McGuinness, D. J. Murray, D. A. Robertson, W. Schleiner, K. J. Shapiro, D. Silvia, R. A. Wiggins.

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. See Pages 63 and 97.

Teaching Credential Subject Representatives. W. Harsh, W. Schleiner. See also page 105 for more details on the 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.

Graduate Adviser. R. H. Hopkins.

Courses in English

Lower Division Courses

A. Language Skills (2) I, II, III. The Staff (Zender in charge) Lecture-discussion—4 hours. Introductory course to help students gain writing proficiency required for successful University-level work. Course will focus on the nature and mechanics of written English and the relationship between writing mechanics and coherent thought. Satisfies Subject A requirement.

R. Communications Skills Workshop (no credit) I, II, III. The Staff (Zender in charge) Lecture—3 hours; discussion—3 hours; laboratory—3 hours. Workshop in language skills for students from non-standard-English backgrounds who do not qualify for English for Foreign Students. Course worth 6 units toward minimum study list requirement. (Deferred grading only, pending passing of course.)

1. Expository Writing (4) I, II, III. The Staff (Zender 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.

2. Language and Stylistics (4) I, II, III. The Staff (Zender in charge) Lecture-discussion—4 hours. Prerequisite: completion of Subject A requirement. Introduction to modern inquiries into the nature and forms of the English language. Frequent writing assignments will be made.

3. Introduction to Literature (4) I, II, III. The Staff (Zender 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.

5F. Introduction to Creative Writing: Fiction (4) I, II, III. The Staff (Zender 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 (Zender 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.

***10A-G. Topics in British and American Literature** (2) I, II, III. Lecture-discussion—2 hours. An introductory course in modern literature designed for non-majors. Authors and topics will vary, drawing from the following subjects: (A) The Fantastic in Recent American Literature; (B) The New Journalism; (C) The Literature of California; (D) The Theater of the Absurd; (E) Love and Death in the American Novel; (F) The Literature of Sport; (G) Feminism and Modern Feminist Literature. (P/NP grading only.)

***20. Intermediate Composition** (4) I, II, III. The Staff (Zender in charge)

Lecture-discussion—4 hours. Prerequisite: one course from 1, 2, 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.

25. English for Foreign Students (5) I, II. Schwabe
Lecture—2 hours; discussion—2 hours; laboratory—1 hour. For foreign students only; required of those who do not pass the examination in English. May be repeated for credit.

26. English for Foreign Students (5) II, III. Schwabe
Lecture—2 hours; discussion—2 hours; laboratory—1 hour. Continuation of course 25.

28. Introduction to Library Research and Bibliography (3) I, II. Library staff (Chairperson in charge)

Lecture—1 hour, practicum—6 hours. Methodology of research in academic libraries including catalogs, indexes and abstracts, bibliographies, specialized sources of information. Emphasis on preparation of detailed bibliographies and term paper research; offered in conjunction with the library.

30A. Survey of American Literature (4) I, Wiggins
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. American literature from the seventeenth century to 1830.

30B. Survey of American Literature (4) II. Wiggins
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. American literature from 1830 to 1900.

30C. Survey of American Literature (4) I, III. Diehl, Hicks
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. American literature of the twentieth century.

43. Critical Reading of Drama (4) II. The Staff (Chairperson in charge)

Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. An introduction to the forms of drama and the development of critical abilities through directed close reading. Frequent written exercises.

***44. Critical Reading of Fiction** (4) I. The Staff (Chairperson in charge)

Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. An introduction to the forms of prose fiction and the development of critical abilities through directed close reading. Frequent written exercises.

45. Critical Reading of Poetry (4) I, II, III. The Staff (Chairperson in charge)

Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. Close reading of selections from English and American poetry. Frequent written exercises.

46A. Masterpieces of English Literature (4) I. The Staff (Chairperson in charge)

Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. Selected works of principal writers to 1640. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

46B. Masterpiece of English Literature (4) II. The Staff (Chairperson in charge)

Lecture-discussion—3 hours; term paper. Prerequisite: from courses 1, 2, 3. Selected works of principal writers from

1640 to 1800. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

46C. Masterpieces of English Literature (4) III. The Staff (Chairperson in charge)

Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. Selected works of principal writers from 1800 to present. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

***47. Introduction to Modern Literature** (4) III.

Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. Chief twentieth-century writers of England and America.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: one course from courses 1, 2, 3. Directed group study of a special topic. 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

100F. Creative Writing: Fiction (4) I, II, III. The Staff (Chairperson in charge)

Discussion—4 hours; evaluation of written materials and conferences with individual students. Prerequisite: course 5F or 5P. Writing of fiction. May be repeated for credit with consent of instructor. No final examination.

100P. Creative Writing: Poetry (4) I, II, III. Shapiro

Discussion—4 hours; evaluation of written materials and conferences with individual students. Prerequisite: course 5F or 5P. Writing of poetry. May be repeated for credit with consent of instructor. No final examination.

103A-F. Advanced Composition (4) I, II, III. The Staff (Chairperson in charge)

Lecture-discussion—3 hours; individual evaluations and conferences. Prerequisite: one course from courses 1, 2, 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; and (F) Composition for Elementary and Secondary Teachers. May be repeated once for credit in different area of emphasis.

104. Scientific Writing (1-3) I, II, III. The Staff (Chairperson in charge)

Lecture—2 hours; discussion—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-science department staff. May be repeated for a total of 4 units of credit. (P/NP grading only)

105A. Language (4) III.

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 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) I.

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 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.

***105C. Language Change Reflected in Literature** (4) III. Schleiner

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Study of literary texts from the various historical periods in the English language, considering, in addition to other stylistic features, those characteristics particularly connected with development and change in the respective linguistics periods.

***105D. Linguistics, Literature, and Composition** (4) III. Harsh

Lecture-discussion—3 hours; term paper. Prerequisite: courses 105A and 105B. Linguistic theories and methods in literary analysis and in composition. Course considers structural linguistics and transformational grammar exemplified in analysis, criticism, and content of belletristic and nonbelletristic written materials.

107. Special Topics in English Language (4) II.

Seminar—3 hours; special project. Prerequisite: one course from courses 1, 2, 3. Investigation of varied subjects in

contemporary and historical English language studies. May be repeated for credit when a different topic is studied. (Same course as Linguistics 107.)

***110A. Introduction to Principles of Criticism** (4) II. Hayden
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The 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. Hayden
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The 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)

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Major types, traditions, and conventions of literature in England from the time of *Beowulf* to the late medieval romances, with special emphasis on the heroic strain, courtly love and its impact, and the development of Arthurian literature. Mostly in translation.

***112. The Age of Chaucer** (4)

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The literary, religious, and social movements of the later fourteenth century in England as they are reflected in the writings of Chaucer, Langland, the *Gawain* poet, and their contemporaries; the fifteenth-century Chaucerians.

113A. Chaucer: *Troilus* and the *Minor Poems* (4) II, Silvia
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The 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. Silvia
Lecture—3 hours; term paper. Prerequisite: one course from 1, 2, and 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.

116. Sixteenth-Century Poetry and Prose (4) II. Levin
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Poetry of Skelton, Wyatt, Surrey, Sidney, Spenser, Marlowe, and Shakespeare; selected discursive prose and fiction. Political, religious, and intellectual background.

117A. Shakespeare: the Early Works (4) I. Levin (Chairperson in charge)

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 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) I, II, III. The Staff (Chairperson in charge)

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 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) III. The Staff (Chairperson in charge)

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Selected major works from Shakespeare's later period. Courses 117A-117B-117C need not be taken in sequence.

118. Shakespeare (4) I, III. The Staff (Chairperson in charge)

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Selected major works by Shakespeare. Recommended for non-majors. May not be applied toward the English major.

120. Earlier Seventeenth-Century Poetry and Prose (4) III. Zender

Lecture-discussion—3 hours; term paper or the equivalent. Prerequisite: one course from courses 1, 2, 3. Major authors, forms, and styles. Donne, Jonson, Marvell, Bacon, Browne, Hobbes. Tradition and revolution.

122. Milton (4) II. Schleiner

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Selected major works, including *Paradise Lost*.

***123. Dryden and His Contemporaries** (4)

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The Restoration in English Literature: Neoclassicism, Ancients versus Moderns, Pyrrhonism, the New Philosophy. Drama, criticism, and satire. Emphasis on the work of John Dryden.

***125. The Age of Swift and Pope: Prose and Poetry** (4) I. Hopkins

Lecture-discussion—3 hours; term paper or the equivalent. Prerequisite: one course from courses 1, 2, 3. The Augustan

NOTE: For key to footnote symbols, see page 130.

Age: reason and imagination. Readings in Swift, Addison, Steele, Defoe, Pope, Gay, Thomson, and others.

127. Prose and Poetry of the Later Eighteenth Century (4) III.

Byrd
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Readings in Johnson, Goldsmith, Boswell, and others; the poetry of the era concluding with Blake.

130. Early Romantic Literature (4) I, Hayden
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Blake, Burns, Wordsworth, Coleridge, Scott; the eighteenth century background and the development of Romantic concepts of imagination.

***132. Later Romantic Literature** (4) II, Hayden
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Byron, Shelley, Keats. Individualism and revolt.

133. Early Victorian Literature (4) I, E. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Tennyson, Browning, Arnold, and selected prose writers. The Victorian temper; the individual and society, the search for faith. The impact of scientific thought upon creative thinkers.

134. Later Victorian Literature (4) II, E. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Ruskin, Hardy, Hopkins, and others. The Oxford movement, the Pre-Raphaelites; art and sociology; aestheticism and decadence; pessimism. Tendencies continuing into the Edwardian period.

***136. British Literature from 1880 to 1918** (4) I, E. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Yeats, Conrad, Joyce. Aestheticism, naturalism, symbolism, and impressionism. The transition from Victorian to twentieth-century styles and attitudes.

***137. British Literature from 1918 to 1940** (4) III, S. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Lawrence, Eliot, Forster, and others. Post-war attitudes. Modern psychology and the awareness of myth.

138. British Literature from 1940 to the Present (4) I, Hanzo
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Literature of England and Ireland from World War II to the present. Major themes in the novel, poetry, and short story.

139. Modern Anglo-Irish Writers (4) III, McGuinness
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. A study of Yeats, Joyce, George Moore, John Synge, James Stephens and others.

140. Origins of American Literature (4) II, Weber
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Seventeenth-century American literature: special attention to European literary-intellectual traditions, dominant American forms (poems, sermon, history), and major writers (Ann Bradstreet, Edward Taylor and others).

141. The American Enlightenment and Its Reaction (4) III, Woodress
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Eighteenth-century American literature: rise of neoclassicism, liberal religion, popular literature, scientific thought, satiric tempers; decline of Puritan traditions; major writers, including Franklin, Edwards, Freneau, and Brackenridge.

142. Early Nineteenth-Century American Literature (4) II, Wiggins
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Beginnings of American romanticism, sentimentalism. Gothic vogue, cultural nationalism. Southwestern humor; prose and poetry of Brown, Bryant, Irving, Cooper, Poe, and Longstreet.

143. Aspects of American Romanticism (4) I, Carter
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Flowering of American romanticism; the metaphysical tradition, Oriental and European antecedents, philosophical idealism, and literary achievement of Transcendentalism (Emerson, Thoreau, Whitman); the critical tempers of Hawthorne and Melville; Emily Dickinson.

144. American Literature from 1865 to 1914 (4) III, Carter
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Religion, local color, social criticism, naturalism, *fin de siècle* aestheticism; Twain, James, Crane, Dreiser, Howells.

***146. Modern American Literature: 1914-1940** (4) Hays
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The Modernist movement, disillusionment, artistic experimentalism, classical revival,

New Criticism, proletarian literature, romantic nationalism, European currents; Pound, Fitzgerald, Eliot, Frost, Hemingway, Crane, Faulkner and Stevens.

147. Modern American Literature: 1940 to the Present (4) I, Hicks

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Contemporary fiction, poetry, and drama. The impact of World War II on the younger writers; experimentation and formalism in poetry and the drama.

***150A. English Drama to Marlowe** (4) II.

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Development of the drama from its beginnings to the Renaissance. Miracle and mystery plays; the morality tradition. Early comedy, tragedy, and chronicle plays.

150B. English Drama from Marlowe to 1642 (4) I, Carr
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Shakespeare's contemporaries in the drama, including Webster, Jonson, Beaumont and Fletcher, and others. The revenge play and tragicomedy; post-Shakespearean development of dramatic action and blank verse.

***150C. English Drama from 1642 to 1890** (4) III, Hopkins
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Restoration and eighteenth-century drama, including Congreve, Sheridan, and others.

***150D. British Drama from 1890 to the Present** (4) III, Hays
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The rise of dramatic realism; the chief reactions against it. Emphasis on Shaw, O'Casey, Osborne.

152. American Drama from Its Beginnings to the Present (4) III, Hays

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Critical and historical survey of drama in America from its eighteenth-century origins with emphasis on O'Neill, Williams, Miller, and others.

155A. The English Novel: 1700-1770 (4) I, McGuinness
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Realism and the rise of the modern novel. Defoe, Richardson, Fielding, Sterne, and Smollett.

155B. The English Novel: 1770-1850 (4) II, Murray
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Sense and Sensibility in the novel. Walpole, Radcliffe, Austen, Scott, Dickens, Bronte sisters.

***155C. The English Novel: 1850-1900** (4) III, E. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Major Victorian novelists: their theory and practice. Dickens, Thackeray, Trollope, Eliot, Meredith, and Hardy.

***155D. The English Novel: 1900 to the Present** (4) III, Hanzo
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Major figures including Conrad, Joyce, and Lawrence. Impressionism, the revolt against naturalism; the experimental novel; the anti-modernist reaction.

156. The Short Story (4) III, Weber
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The short story as a genre; its historical development, techniques, and formal character as a literary form. European as well as American writers.

***158A. The American Novel to 1900** (4) III.
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Rise and development of the American novel from its beginnings. Hawthorne, Melville, Twain, and others.

158B. The American Novel from 1900 to the Present (4) II, Hays
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Major American novelists of the twentieth century. Faulkner, Hemingway, Fitzgerald, and others.

***160. The English Lyric** (4) III.

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The history of poetic style from the sixteenth to the twentieth centuries. Major examples of the short poem in relation to intellectual history, to foreign influences, and to the development of poetic forms.

***170A. The Epic** (4) II, Zender

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Studies in the development of the epic.

171. English Bible as Literature (4) III, Robertson
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Old Testament poetry and prophecy; the Gospels and certain Epistles.

***173. The Literature of Science Fiction** (4) I, Hanzo
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 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.

174. Agricultural Experience through American Literature (4) I, Weber

Lecture-discussion—3 hours; paper. Prerequisite: one course from 1, 2, and 3, or standing above Freshman level. Agricultural experience through American fiction, poetry, and other literary forms from colonial times to the present. Reading of important authors such as Steinbeck, Frost, Cather, Garland, Crèvecoeur, Rolvaag, Hawthorne, Glasgow, and Faulkner.

175. American Literary Humor (4) I, Weber
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 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.

179. Multi-Ethnic Literature (4) III, Weber
Lecture-discussion—3 hours; papers. Prerequisite: one course from courses 1, 2, 3 or above standing 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) I, III, Wiggins
Lecture-discussion—3 hours; paper. Prerequisite: one course from courses 1, 2, 3. Historical backgrounds and development of types of children's literature, folklore and oral tradition, levels of interest, criticism and evaluation, illustration and bibliography.

181. Black Literature (4) III, Hicks
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. A study of the writings of black Americans, including Chestnut and Dunbar in the nineteenth century, the writings of the Harlem Renaissance in the twentieth century, and the more important contemporary black writers, such as Wright, Ellison, Baldwin, Hansberry and Jones.

***182. Sexuality and Sexual Experience in Literature** (4) I, Weber
Lecture-discussion—3 hours; term paper. Prerequisite: one course from English 1, 2, 3. Sexual experience in English language literature, poetry and prose, cultural sanctions, literary sanctions, eroticism and pornography. National origin of literature to be taught will depend on instructor.

183. Film as Narrative (4) II, Baker, III, Silvia
Lecture—2 hours; discussion—1 hour; film viewing—1½-2 hours. Prerequisite: one course from courses 1, 2, 3; Dramatic Art 15 or consent of instructor. A close study of modern cinema (1930-60) as a storytelling medium. Emphasis on the work of American and British artists (Ford, Huston, Hitchcock, Welles).

***184. Advanced Filmmaking** (4) III, Baker
Lecture-discussion—2 hours; laboratory—3 hours. Prerequisite: course in filmmaking. Creation of short, independent film productions. Each student will undertake to write a script, then shoot and edit a short 16mm movie. Limited enrollment.

185. Literature by Women (4) II, Diehl
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. English language literature by women from Bradstreet and Behn to the Brontës, Eliot, Woolf, Plath, and Rich. The effects of social constraints upon women's art; the rise of feminism; new trends in literary criticism.

***186. History and Production of the Book** (4) II.
Lecture-discussion—3 hours; discussion—1 hour; laboratory—1 hour. Prerequisite: one course from courses 1, 2, 3. The course will cover a history of book production from the earliest written records to modern bookmaking techniques. Students will make paper and papyrus, will print and bind their book. Also covered are manuscript production, alphabet, type casting, book design.

187. Literature and Other Arts (4) III, Robertson
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) 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. May be repeated for credit with consent of instructor.
- 189. Study of a Major Writer** (4) I, III. The Staff (Chairperson in charge)
Seminar—3 hours; term paper. Prerequisite: junior or senior standing; a major in English or consent of instructor. The artistic development of one major writer and his intellectual and literary milieu. Limited enrollment. May be repeated for credit with consent of instructor.
- 192. Internships in English** (2-4) I, II, III. The Staff (Chairperson in charge)
Field work. Prerequisite: one course from courses 1, 2, 3. Internships in fields where English majors can practice their skills. A maximum of 4 units allowed toward major requirements. May be repeated for credit for a total of 12 units. (P/NP grading only.)
- 196. Stylistics** (4) II. ———
Seminar—3 hours; term paper. Prerequisite: course 105A. Analysis of linguistic stylistic variations in specific works to be selected from the corpus of writings in English. (Same course as Linguistics 196.)
- 197T. Tutoring in English** (1-4) I, II, III. The Staff (Chairperson in charge)
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)
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, 2, 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) I, Hopkins
Discussion—3 hours. 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) II. Hayden
Discussion—3 hours. Survey of the major critics from Aristotle to the present, with emphasis on the relationship of critical theory to the history of literature.
- *203. Theory and Practice of Written Composition** (4) III. Harsh
Seminar—3 hours; practical exercise of writing and tutorial assignments. Students admitted into this course by examination of their own writing skills. (Those with insufficient advanced command of writing shall be required to take a special section of course 103, at no credit, before enrolling in course 203.) Instruction in the teaching of composition. Emphasis on mastering both the basics and finer points of expository prose and on teaching such skills to others.
- *204. American English from 1600 to Present Day** (4) III.
Discussion—3 hours; term paper. Historical changes reflected in American writing and the study of dialect variations. Emphasis will be on patterns of development of phonology, morphology, syntax, and lexicon and on characteristics of regional writing and dialectal variants.
- 205. Introduction to Old English** (4) I.
Discussion—3 hours; written reports; individual conferences. The language of Anglo-Saxon England; readings in Old English prose and poetry.
- 206. Beowulf** (4) II.
Discussion—3 hours; oral and written report; conferences with students. Prerequisite: course 205 or the equivalent. A study of the poem and the Heroic Age of Germanic literature. Offered in odd-numbered years.
- *207. Middle English** (4) III.
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.

- *208. Early Modern English** (4) II. Harsh
Discussion—3 hours; term paper. Study of writings in the period from the Renaissance to the present day. Intensive reading of texts will include consideration of phonology, morphology, syntax, lexicon, and pertinent linguistic changes in the historical period.
- 209. Present-Day English Linguistics** (4) III.
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) I, Woodress
Discussion—3 hours. Prerequisite: upper division English course in area to be studied. Offered in multiple sections each quarter. Content varies according to specialty of instructor. Course designed for students preparing for their comprehensive examinations. May be repeated for credit.
- *215. Arthurian Romance** (4) I.
Discussion—3 hours. The sources of Arthurian Romantic literature. Continental and English literary treatment; Malory's synthesis; significant changes of attitudes in post-Malory literature.
- *225. Topics in Irish Literature** (4) II. McGuinness
Seminar—3 hours. 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.
- *228. Library Methods and Literary Criticism for the Teaching of English** (4) I. The Staff
Lecture-discussion—3 hours; laboratory—2 hours. Introduction to library resources, bibliography, and modes of criticism for the prospective teacher of English on the secondary and postsecondary level.
- *230. Study of a Major Writer** (4) I, Woodress; III, Hopkins
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) I, Dale; III, Hayden
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) I, Robertson; II, Hays; III, Carter
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) III, R. Cohn (Dramatic Art)
Seminar—3 hours. Historical introduction to dramatic theory; the genres of tragedy, comedy, and tragicomedy.
- *235A. Theory of Fiction** (4) II. Hanzo
Seminar—3 hours; preparation and evaluation of research paper. Theories of fiction as reflected in the practice of writers from the eighteenth century to the present.
- 235B. Theory of Fiction** (4) II
Seminar—3 hours; preparation of a work of fiction and a critical explanation of it. Prerequisite: graduate standing in creative writing program. Investigation of fiction from the writer's, not the critic's view: choices, strategies, approaches, and the factors limiting those choices; also relation of the writer to his work.
- 236. Poetics** (4) II. Shapiro
Seminar—3 hours. Metaphor, style and structure in English poetry from the sixteenth century to the present.
- *237. Modern Critical Theory** (4) II. Hanzo
Seminar—3 hours. Examination of problems in the theory underlying the practice of literary criticism from I. A. Richards and T. S. Eliot to the present.
- *240A-240B-240C. Medieval Literature** (4-4-4) III. Murphy
Seminar—3 hours; conference—1 hour. Studies of Medieval literature. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *242A-242B-242C. Sixteenth-Century Literature** (4-4-4) A; II, Silvia
Seminar—3 hours; conference—1 hour. Studies in sixteenth-century literature. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *244A-244B-244C. Shakespeare** (4-4-4) I-II-III. Schleiner, Levin
Seminar—3 hours; conference—1 hour. Studies in Shakespeare. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- 246A-246B-246C. Seventeenth-Century Literature** (4-4-4) A; I, Schleiner
Seminar—3 hours; conference—1 hour. Studies in seventeenth-century literature. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *248A-248B-248C. Eighteenth-Century Literature** (4-4-4) I-II-III. Hopkins
Seminar—3 hours; conference—1 hour. Studies in eighteenth-century literature. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *250A-250B-250C. Romantic Literature** (4-4-4) I-II-III. Hayden
Seminar—3 hours; conference—1 hour. Studies in Romantic literature. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *252A-252B-252C. Victorian Literature** (4) I-II-III. Gilbert
Seminar—3 hours; conference—1 hour. Studies in Victorian literature. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *254A-254B-254C. Twentieth-Century British Literature** (4-4-4) I-II-III.
Seminar—3 hours; conference—1 hour. Studies in twentieth-century British literature. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *256A-256B-256C. Early American Literature** (4-4-4) I-II-III. Woodress
Seminar—3 hours; conference—1 hour. Studies in Early American literature. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *258A-258B-258C. American Literature: 1800 to Civil War** (4-4-4) B; II, Diehl
Seminar—3 hours; conference—1 hour. Studies in American literature from 1800 to Civil War. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *260A-260B-260C. American Literature: Civil War to 1914** (4-4-4) C; III, Woodress
Seminar—3 hours; conference—1 hour. Studies in American literature from the Civil War to 1914. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- 262A-262B-262C. American Literature after 1914** (4-4-4) A; I, Hicks
Seminar—3 hours; conference—1 hour. Studies in American literature after 1914. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- *264A-264B-264C. Studies in Modern British and American Literature** (4-4-4) B; II, Hanzo
Seminar—3 hours; conference—1 hour. Studies in modern British and American literature. Materials for course to be selected by instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.
- 290F. Seminar in Creative Writing of Fiction** (4) I, II, III. The Staff (Shapiro in charge)
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.
- 290P. Seminar in Creative Writing of Poetry** (4) I, II, III. The Staff (Shapiro in charge)
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.)

NOTE: For key to footnote symbols, see page 130.

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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) I.

Lecture-discussion—2 hours. Prerequisite: senior of graduate standing; an English teaching major or minor. This course should be completed before practice teaching. Course is accepted in partial satisfaction of the requirement in education for the general secondary credential.

302. Materials of Teaching English as a Second Language (ESL) (4) II. Schwabe

Lecture—3 hours; practice teaching—3 hours. Prerequisite: Linguistics 300. Design and development of classroom curricula and surveying/evaluating ESL materials combined with instructing classes in the ESL Clinic. Guided practice in teaching English pronunciation, grammar and sentence structure, listening comprehension and composition, discussion, and reading to foreign students.

303. Recent Research and Problems in ESL (4) III. Schwabe

Lecture—1 hour; practice teaching—2, 4, or 6 hours. Prerequisite: course 302. Analysis of a particular problem in teaching English as a second language (ESL) and testing possible solutions. Course work will include a review of literature in this area as well as presentation of a paper addressing problem/solution.

390. Teaching English at the College Level (2) I. Zender

Discussion—2 hours. Prerequisite: graduate standing and concurrent appointment as teaching assistant in Department of English. Consideration of the problems and techniques of teaching composition and literature at the college level. (S/U grading only.)

392. Teaching Internship in English (2) I, II, III. The Staff (Coordinator of Writing Programs in charge)

Supervised internships—4 hours. Prerequisite: graduate standing. In-class internship with English Department faculty member. (S/U grading only.)

401. Editing "California Quarterly" (2) I, II, III. E. Gilbert Seminar—2 hours; conference—1 hour. Prerequisite: participation in Creative Writing Program. Students will read all manuscripts submitted to *California Quarterly* and attend weekly editorial board meetings, choosing manuscripts for publication. They will also participate in copy-editing, copyreading, layout, and other aspects of journal production. May be repeated for a total of 6 units. (S/U grading only.)

Entomology

(College of Agricultural and Environmental Sciences)

Martin C. Birch, D.Phil., Chairperson of the Department

Department Office, 367 Briggs Hall (752-0475)

Faculty

Oscar G. Bacon, Ph.D., Professor
 Stanley F. Bailey, Ph.D., Professor Emeritus
 Martin C. Birch, D.Phil., Associate Professor
 Richard M. Bohart, Ph.D., Professor Emeritus
 James R. Carey, Ph.D., Assistant Professor
 Sean S. Duffey, Ph.D., Assistant Professor
 Lester E. Ehler, Ph.D., Associate Professor
 Norman E. Gary, Ph.D., Professor
 Jeffrey Granett, Ph.D., Assistant Professor
 Albert A. Grigarick, Jr., Ph.D., Professor
 Charles L. Judson, Ph.D., Professor
 Harry K. Kaya, Ph.D., Associate Professor
 Harry H. Laidlaw, Jr., Ph.D., Professor Emeritus
 W. Harry Lange, Jr., Ph.D., Professor
 Thomas F. Leigh, Ph.D., Lecturer
 Benjamin F. Lowensbery, Ph.D., Professor (Nematology)
 Armand R. Maggenti, Ph.D., Lecturer (Nematology)
 G. A. H. McClelland, Ph.D., Professor
 Donald L. McLean, Ph.D., Professor
 Christine Y. S. Peng, Ph.D., Assistant Professor

Timothy Prout, Ph.D., Professor (Entomology, Genetics)

Dewey J. Raski, Ph.D., Professor (Nematology)

Richard E. Rice, Ph.D., Lecturer

Eugene M. Stafford, Ph.D., Professor Emeritus

Francis M. Summers, Ph.D., Professor Emeritus

Robbin W. Thorp, Ph.D., Professor

David R. Viglierchio, Ph.D., Lecturer (Nematology)

Philip S. Ward, Ph.D., Assistant Professor

Robert K. Washino, Ph.D., Professor

The Major Program

The Entomology major provides students an opportunity for extensive study of insects—their behavior, classification, structure, physiology, and ecology. Some of the areas of emphasis in entomology are: biosystematics, management of pest insects with natural enemies and chemicals, management of honeybees for pollination of agricultural crops and honey production, nematology and transmission of plant and animal pathogens. Employment opportunities are available in managerial and technical positions with state and federal agencies and agricultural production or chemical companies. Some entomology graduates prepare to teach entomology and other biological sciences in high schools and junior colleges. Other graduates matriculate in graduate programs leading to a higher degree.

Entomology

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
Preparatory Subject Matter	77
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Zoology (Zoology 2-2L)	6
Bacteriology (Bacteriology 2)	3
Genetics (Genetics 120)	4
Plant or animal pathology, or plant or animal physiology	4
Biochemistry (Biochemistry 101A, 101B)	6
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Mathematics (including statistics)	7
Physics (Physics 2A and 2B)	6
Elective courses in biological science (exclusive of entomology) including one course in evolution (Genetics 103 or Zoology 148); must be upper division units	15
Depth Subject Matter	28
Entomology 100, 101A, 101B, 103, 104, and 109, or 105 and another upper division course in entomology which requires a collection of insects	28
Breadth Subject Matter	36
English and/or rhetoric (see College requirement)	8
Electives in social sciences and humanities†	28
Unrestricted Electives	39
Total Units for the Major	180

Major Adviser. C. L. Judson.

Graduate Study. The Department of Entomology offers a program of study and research leading to the M.S. and Ph.D. degrees. See page 99 and the *Announcement of the Graduate Division* for further details.

Graduate Advisers. See *Class Schedule and Room Directory*.

Related Courses. See courses in Nematology.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Courses in Entomology

Lower Division Courses

10. Natural History of Insects (3) II. Bacon
 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.

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 (5) I, Thorp
 Lecture—3 hours; laboratory—6 hours; optional Saturday field trips to be arranged. Prerequisite: Biological Sciences 1 or the equivalent. Biology of insects including: morphology, physiology, development, ecology, classification of orders and common families, and relation to human welfare.

101A, 101B. Insect Structure and Function (4-4) A-I; B-II. Birch, Judson, Peng

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100; Chemistry 8B recommended; (course 101A recommended prior to 101B.) Principles of evolutionary, functional and comparative aspects of insect morphology, and study of the mechanisms and processes by which insects maintain themselves and adapt to the environment. Laboratory sessions cover basic insect structure and introduce research principles and techniques.

103. Systematic Entomology (4) III. Ward.

Lecture—2 hours; laboratory—6 hours. Prerequisite: introductory course in zoology or entomology. The principles of animal taxonomy; speciation; introduction to classification and nomenclature.

104. Insect Ecology (4) II. Carey

Lecture—3 hours; discussion—1 hour. Prerequisite: a general biology course. Principles of animal ecology with emphasis on insect population dynamics: analysis of factors influencing distribution and abundance. Application of basic theory to management of pest insect populations with focus on biological control and related approaches. Community structure and dynamics.

105. Insect Classification (3) II. Thorp, Grigarick, Ward
 Lecture—1 hour; laboratory—6 hours. Prerequisite: course 100. Principles and methods of classification of insects to the family level with emphasis on identification.

106. Field Entomology (4) III. Thorp

Laboratory—6 hours; weekend field trips—8-10 days. Prerequisite: course 105 or consent of instructor. Collection and comparative analysis of insect faunas from selected ecological zones in California. Offered in odd-numbered years.

108. Chemical Control of Insects (4) III. Granett

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110 or 112, Chemistry 8A, 8B; Biochemistry or Animal Physiology recommended. Study of chemicals used to control insects and mites with regard to mode of action, chemistry, metabolism and applied uses, particularly within an integrated control framework. Chemical-insect and chemical-environment interactions. Practical aspects of chemical use.

109. Field Taxonomy and Ecology (7) Extra-session summer.

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 even-numbered years.

110. Economic Entomology (4) I. Grigarick.

Lecture—2 hours; laboratory—6 hours. An introductory course dealing with the 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.

112. Agricultural Pest Management (4) II. Lange

Lecture—3 hours; laboratory—3 hours. Prerequisite: upper division standing in one of the biological sciences or consent of instructor. An introduction to the principles of pest management as they apply to representative agricultural crops with emphasis on the integration of all available control measures in the development of crop protection strategies.

- 116. Biology of Aquatic Insects** (3-5) III. Grigarick
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.
- 118. Crop Resistance to Arthropod Pests** (4) III. Leigh
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 110 or the equivalent; upper division standing; additional entomology, genetics and plant science courses recommended. An introduction to host plant resistance as a durable and efficient technique applicable to pest management systems. Procedures and methods. Designed for students in agricultural entomology and crop production. Offered in odd-numbered years.
- 119. Apiculture** (3) II. Gary
Lecture—3 hours. Biology and behavior of honeybees; communication, orientation, social organization, foraging activities, honey production, pollination activities.
- 119L. Apiculture Laboratory** (2) III. Gary
Discussion—1 hour; laboratory—3 hours; field trips taken primarily during laboratory time. Prerequisite: course 119 or consent of instructor. Biology and behavior of honey bees; fundamentals of culture, management, and use of colonies for agricultural, recreational, teaching, and research purposes. Field trips to industrial activities.
- 120. Insect Host-Plant Interactions** (4) II. Duffey
Lecture—3 hours; discussion—1 hour. Prerequisite: course 101A-101B; Biochemistry 101A-101B or the equivalent; general introductory course in botany and/or plant physiology will be helpful. Morphological, physiological and biochemical bases of host-plant selection by insects; consideration of bases of host-plant resistance to insects. Emphasis on comparative defensive biochemical interaction between various organisms particularly plants and insects.
- 121. Insect Behavior** (4) III. Birch
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in one of the biological sciences and one course in entomology or consent of instructor. Mechanisms of insect behavior; includes physiological basis for behavior, specific patterns and types of behavior, comparative studies, learning and evolution of behavior.
- 123. Classification of Immature Insects** (4) III. Lange
Lecture—2 hours; laboratory—6 hours. Prerequisite: introductory course in entomology. Criteria used to identify the immature forms of the principal orders and families of insects; primary emphasis on economic groups. Offered in even-numbered years.
- 125. Insect Vectors of Plant Pathogens** (4) III. McLean
Lecture—3 hours; discussion—1 hour. Prerequisite: one course in entomology or plant pathology, or consent of instructor. Biological, physiological and biochemical interrelationships between insect vectors and the plant pathogens they transmit. Emphasis is placed on the insect vector interactions with plant viruses and mycoplasmas. Offered in odd-numbered years.
- 127. Acarology** (4) I, Ehler
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 103 or consent of instructor. The systematics, ecology, morphology, physiology and evolution of mites; management of pest species. Offered in odd-numbered years.
- 130. Biological Control** (4) I, Ehler
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or consent of instructor. Theory and practice of biological control of arthropod pests; biology of entomophagous arthropods, role of insects in weed control, microbial control of insects and mites.
- 140. Insect Pathology** (4) III. Kaya
Lecture—3 hours; laboratory—3 hours. Prerequisite: introductory course in entomology and at least one course in a microbiological science. Principles of insect pathology and insect microbiology; noninfectious and infectious diseases of insects, diagnosis, epizootiology, therapy, and microbial control.
- 153. Medical Entomology** (4) I, McClelland
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.
- 155. Management of Medically Important Arthropods** (3) I, Washino
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 153 or consent of instructor. Lectures and laboratory sessions to consider the practical aspects of arthropod vector control practices within the framework of a human-domestic animal disease management program.
- 156. Biology of Parasitism** (3) III, Washino, in charge; Theis (School of Medicine), Lavoipierre (Veterinary Microbiology), Maggenti (Nematology)
Lecture—3 hours. Prerequisite: Biological Sciences 1 or consent of instructors. Lectures on the biological and ecological aspects effecting host-parasite relationships using selected examples from protozoan and metazoan fauna.
- 156L. Biology of Parasitism Laboratory** (1) III, Washino, in charge; Theis (School of Medicine), Lavoipierre (Veterinary Microbiology), Maggenti (Nematology)
Laboratory—3 hours. Prerequisite: course 156 (concurrently) 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.
- 170. Insect Pest Management** (6) Extra-session summer. Leigh, Rice, Summers
Lecture—60 hours total; laboratory and field trips—100 hours total. Prerequisite: upper division standing and at least one course in agricultural entomology or insect ecology. Field course in pest management principles and practices. Students participate in detection and sampling for pest and beneficial species and evaluation of damage; and also plan and conduct experiments utilizing biological, chemical, and cultural control methods.
- 192. Internship** (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in all subjects areas offered in the Department of Entomology. Internships supervised by a member of the faculty. (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**
- 201. Theoretical Aspects of Pest Management** (3) II. Carey
Lecture—2 hours; discussion—1 hour. Prerequisite: Statistics 131A-131B-131C, Mathematics 21A-21B-21C, and knowledge of Fortran. The theory of crop ecosystem analysis and modeling using various crop-pest models.
- 202. Advanced Insect Physiology** (2) III. Judson
Lecture—2 hours. Prerequisite: course 101B or the equivalent or consent of instructor; Biochemistry 101A or 101B recommended. Selected topics of insect physiology. Intensive study of topics of current interest, which will vary from year to year. Course may be repeated for credit. Offered in odd-numbered years.
- 202L. Advanced Insect Physiology Laboratory** (2) III. Judson
Laboratory—6 hours. Prerequisite: course 101B or Zoology 142. Investigations of selected aspects of insect physiology. Independent projects may be undertaken. Offered in odd-numbered years.
- 207. Genetic Control of Insect Pests** (3) I, Prout
Lecture—3 hours. Prerequisite: elementary genetics, plus population genetics or evolutionary theory; graduate or upper division standing in biological science; some knowledge of insect ecology and model construction recommended. Application of population genetic theory to ways of altering the genetic constitution of pest populations: including sterile male release, delayed sterility methods, sex ratio distortion, the use of various cyto-genetic procedures and meiotic drive to transform populations. Offered in odd-numbered years. (S/U grading only.) (Same course as Genetics 207.)
- 219. Advanced Apiculture** (4) III. Peng
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 119L or consent of instructor. Current topics in bee biology with special consideration of morphology, caste determination, queen rearing, nutrition, physiology, pathology, and products of honey bees.
- 245. Pollination Ecology** (4) III. Thorp, Webster (Botany)
Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: consent of instructors. Theory of ecological relationships between plants and their pollinators with emphasis on insect pollination. Review of adaptations of both flowers and insects, and survey of the coevolution of pollination relationships. Offered in even-numbered years. (Same course as Botany 245.)
- 253. Advanced Medical Entomology** (4) III. McClelland, Lavoipierre (Veterinary Microbiology)
Lecture—2 hours; laboratory—6 hours. Prerequisite: one upper division course in entomology (other than course 153) and one course in microbiology; course 153 recommended. An analysis of several arthropod-borne human diseases with emphasis on the relationship of the biology of the vector to the ecology of the disease. Laboratory emphasis on general techniques and in depth study of a selected vector group. Offered in even-numbered years.
- 255. Electrical Principles Related to Biological Research** (4) II, McLean
Lecture—3 hours; laboratory—3 hours. Prerequisite: course in college physics; graduate standing in a biological science or consent of instructor. Basic electrical principles of ac and dc circuits. Methods of electrical measurements, discussion of semiconductor devices, and basic circuits of power supplies, amplifiers, oscillators, and electronic switching are presented in relation to biological measurement systems. Offered in even-numbered years.
- 275A. Principles and Methods of Entomological Research** (4) II. The Staff (McClelland in charge)
Lecture—2 hours; laboratory—6 hours. Prerequisite: Agricultural Science and Management 150, Statistics 13 or the equivalent. Philosophy of research and principles of scientific inquiry related to entomological science with emphasis on problem selection, work planning, design of experiments, methods of observation, data collection and application of statistics. Offered in odd-numbered years.
- 275B. Principles and Methods of Entomological Research** (4) II. The Staff (McClelland in charge)
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 275A. Principles of scientific inquiry related to entomological science with emphasis on the synthesis of research results for written and oral presentation. Development of skills in scientific communication. Offered in even-numbered years.
- 290. Special Topics in Entomology** (1-4) I, II, III. The Staff (Ehler in charge)
Seminar—1-4 hours. Prerequisite: consent of instructor.
- 291. Seminar in Medical Entomology** (2) I, McClelland, Washino
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, Judson, McLean, Birch, Duffey
Seminar—2 hours. Prerequisite: course 101B. Critical examination of areas of current interest to insect physiology and biochemistry.
- 293. Seminar in Systematic Entomology** (2) III. Ward, Grigarick, Thorp
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
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) I, II. Bacon, Grigarick, Ehler, Granett
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, Gary, 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) II. Gary, Birch
Seminar—2 hours. Prerequisite: course 121. 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.)

Environmental Horticulture

(College of Agricultural and Environmental Sciences)

Richard W. Harris, Ph.D., Chairperson of the Department

Department Office, 140 Environmental Horticulture Building (752-0130)

Faculty

Seymour M. Gold, Ph.D., Associate Professor (Environmental Planning and Management)
 Wesley P. Hackett, Ph.D., Professor
 James A. Harding, Ph.D., Professor
 Richard W. Harris, Ph.D., Professor
 Charles E. Hess, Ph.D., Professor
 Ronald W. Hodgson, Ph.D., Assistant Professor (Environmental Planning and Management)
 Anton M. Kofranek, Ph.D., Professor
 Harry C. Kohl, Jr., Ph.D., Professor Emeritus
 Andrew T. Leiser, Ph.D., Professor
 John H. Madison, Jr., Ph.D., Professor Emeritus
 James D. MacDonald, Ph.D., Assistant Professor (Plant Pathology)
 Jack L. Paul, Ph.D., Associate Professor
 Michael S. Reid, Ph.D., Assistant Professor
 Roy M. Sachs, Ph.D., Professor
 Robert L. Thayer, Jr., M.A., Assistant Professor (Environmental Planning and Management)
 Lin L. Wu, Ph.D., Assistant Professor

Related Major Programs and Graduate Study. See the undergraduate majors in Environmental Planning and Management (this page) and Plant Science (page 276); and for graduate study see page 99.

Related Courses. See Plant Science.

Courses in Environmental Horticulture

Lower Division Courses

6. Introduction to Environmental Plants (3) I, Harding
 Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2 or Plant Science 2. Growth, form, and origin of plants used in landscape and home discussed in relation to their uses and climatic and cultural requirements. Students learn to identify environmental plants.

10. Landscape Horticulture for the Home and Community (3) III, Kofranek
 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)
 Lecture—3-36 hours. Prerequisite: lower division standing, Botany 2 or Plant Science 1 or 2, and consent of instructor. Work-learn 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 (Harris in charge)
 (P/NP grading only.)

Upper Division Courses

105. Taxonomy and Ecology of Environmental Plants (4) I, Leiser
 Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: course 6 or one course in taxonomy. Taxonomy of the important plants used in the western landscape. Emphasis will be placed on the identification, nomenclature, characteristics and uses of woody plants in man's environment.

107. Herbaceous Environmental Plants (3) III, Madison
 Lecture—2 hours; laboratory—3 hours. Prerequisite: course 6 or one course in taxonomy. Identification, ecology, and use of herbaceous environmental plants, with emphasis on floricultural and foliage plants, garden annuals, and perennials.

115. Advanced Taxonomy and Ecology of Environmental Plants (4) III, Leiser

Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: course 105 or consent of instructor. Identification, nomenclature and classification of plants for man's environment are studied in relation to extensive variations and ecological modification. Emphasis is placed on the use of plants in western climatic zones. Nomenclature codes are discussed. Offered in odd-numbered years.

120. Management of Container Soils (3) I, Paul

Lecture—2 hours; laboratory—3 hours. Prerequisite: Soil Science 2. Appropriate use of sand, mineral soil and amendments to formulate container soils. Management of container soils emphasizing irrigation, salinity control and fertilizer practices.

125. Flower Crop Production and Marketing (4) II, Kofranek
 Lecture—3 hours; laboratory—3 hours; one two-day field trip. Prerequisite: course 120. Plant Science 2. The technology of planning, growing, and marketing flower crops, particularly greenhouse crops, as an application of principles. Major flower crops are considered in detail.

126. Nursery Management (2) III, Hackett
 Lecture—2 hours; one all day field trip. Prerequisite: Plant Science 109, senior standing in plant science. The management of woody ornamental crops in relation to propagation, other cultural practices and marketing. Emphasis on planning and scheduling nursery production. One Saturday field trip required.

130A. General Turf Culture (2) III, Madison

Lecture—2 hours and laboratory—3 hours (first two-thirds of the quarter). Prerequisite: Plant Science 2 or Botany 2 and a course in Soil Science. Principles and practices leading to successful planting, establishment, and maintenance of turf. Topics include variety selection, seedbed preparation, fertilization, irrigation, design of sprinkler systems, mowing, and pest control.

130B. Fine Sporting Turf (2) III, Madison

Lecture—2 hours and laboratory—3 hours (last one-third of the quarter). Prerequisite: courses 120 and 130A. The installation and management of fine sporting turf areas used for golf, bowling, lawn tennis, football, etc.

133. Arboriculture (4) II, Harris

Laboratory—3 hours; discussion-testing—4 hours. Prerequisite: Plant Science 2 or Botany 2. Principles and practices of selecting, planting and maintaining trees, shrubs and vines in urban and natural landscapes. Course given in Personalized System of Instruction format. Students should enroll when juniors if they wish to assist with the course next year.

155. Plant Selection for Environmental Design (3) II,

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 6 and Environmental Planning and Management 20. Ability, characteristics, and limitations of landscape plants and plantings to modify the environment, control traffic, reduce erosion, create amenity, etc., with emphasis on specific species.

156. Landscape Planting Design (4) III, Thayer

Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 105, 155, and Environmental Planning and Management 22. Application of aesthetic, functional, and horticultural principles to the composition of the planted landscape and the development of planting plans. Limited enrollment.

192. Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)

Laboratory—3-36 hours. Prerequisite: completion of 84 units, two upper-division courses in Environmental Horticulture appropriate for the internship and consent of instructor. Work-learn 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 (Harris in charge)

Hours and duties will vary depending on course tutored. Prerequisite: upper division standing, completed course or the equivalent being tutored, consent of instructor. Leading discussion sections, conducting laboratory exercises or proctoring in personalized-system-of-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. Selected problems in floriculture, nursery management, and landscape horticulture. (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

241. Analysis of Horticultural Problems (3) III, Paul

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.

251. Modeling Productivity of Greenhouse Flower Crops (3) II, Kohl

Lecture—2 hours; discussion—1 hour. Prerequisite: course 125, Plant Science 101. Course will introduce students to system modeling using the DYNAMO computer program. Economically important production parameters of greenhouse flower crops will be studied and experience will be gained in using computer models to maximize economic flower crop production.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge) Seminar—1 hour. Selected topics in floriculture, nursery management, and environmental horticulture.

298. Group Study (1-5) I, II, III. The Staff (Sachs in charge) Group study on advanced topics in floriculture, nursery management, and environmental horticulture.

299. Research (1-12) I, II, III. The Staff (Sachs in charge) Prerequisite: graduate standing. Research in floriculture, nursery management, and environmental horticulture. (SU/grading only.)

Environmental Planning and Management

(College of Agricultural and Environmental Sciences)

Program Office, Temporary Building 105 (752-6326)

Faculty

See under the Department of Environmental Horticulture.

The Major Program

The Environmental Planning and Management major* provides opportunities to study the relationships between people and the environment through a common core of courses and the development of competence in one of two options. Employment opportunities in the public or private sector that may be available to graduates are illustrated below. Graduate study or experience may be essential for some occupations.

The (1) *Park Administration and Interpretation* option emphasizes administrative processes in the allocation, development and management of outdoor recreation systems, resources and facilities. It encompasses both administrative and interpretive principles to facilitate human-environment interactions: park and recreation director, park ranger, park naturalist, park superintendent, outdoor education specialist, conservation information officer, resort manager, recreation planner. The (2) *Landscape Architecture* option emphasizes the design and development of landscapes: landscape architect, landscape contractor. Students applying for this option are admitted into the Exploratory Program (see page 69).

The Environmental Planning and Management advisers recommend career experience through work-learn internships, summer jobs, or stopping out for a quarter or more to work with appropriate public agencies or private firms.

*Also see the Environmental Policy Analysis and Planning major.

Environmental Planning and Management

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more advanced courses may be taken with the adviser's approval. *Courses shown without parentheses are required.*)

	UNITS
Common Core Courses	72
(Lower Division)	
Chemistry (Chemistry 1A or 10)	4†
Physics (Physics 1A, 2A or 10)	3†
Earth sciences (Geography 1, Geology 1, Soil Science 2)	6†
Biology (Biological Sciences 1 or 10)	4†
Mathematics (Mathematics 16A, 16B, 19, 29, 36A, Statistics 13, or Agricultural Science and Management 150)	6†
Environmental issues (Environmental Studies 10, Environmental Toxicology 10 or Resource Sciences 100)	3†
Landscape architecture, Environmental Planning and Management 20, 22	6
Economics (Economics 1A or 1B)	5
Other social sciences, introductory courses in at least two of the following subject areas: cultural anthropology (Anthropology 2), human geography (Geography 2, 5), psychology (Psychology 2B, 2C, 10, 1, 16), sociology (Sociology 1)	11†
Expository writing (English 1)	4
Public speaking (Rhetoric 1 or 3)	4
Humanities elective	4
(Upper Division)	
Urban and regional planning (Environmental Planning and Management 110)	4
Outdoor recreation, Environmental Planning and Management 116 or 127	4
General ecology, Environmental Studies 100 or 110	4
Park Administration and Interpretation Option	
Biological science, Botany 2	5
Botany, plant science, wildlife and fisheries biology, zoology	3†‡
Environmental plants, Environmental Horticulture 6	3
Resource management, at least five courses chosen from Environmental Horticulture 105, 130A-130B, 133, 155, Environmental Planning and Management 129, 144, or courses in geology, meteorology, range management, water science or soil science	16†‡
Economics, Agricultural Economics 147, 148, Economics 125A or 125B	4
Communications, Environmental Planning and Management 125	4
Environmental Planning and Management 160A or upper division course in applied behavioral science, English, or rhetoric	3†‡
Public administration, Agricultural Economics 112, Political Science 180-188 or 189	4
Park administration, Environmental Planning and Management 122	4
Recreation planning, Environmental Planning and Management 134 or 136	3†
Individual requirements	29‡

Landscape Architecture Option	
Botany 2	5
Natural resources: Botany 102, Environmental Studies 116, 151, Wildlife and Fisheries Biology 10, Zoology 2 or 116	4
Landscape horticulture, Environmental Horticulture 130A, 133	5
Environmental plants, Environmental Horticulture 6, 105	7
Plant selection, Environmental Horticulture 155	3
Planting design, Environmental Horticulture 156	4
Two-dimensional design, Art 16, Design 21 or Engineering 4	3†
Three-dimensional design, Art 5, 112, 121A, Design 130 or 134	4
Landscape graphics, Environmental Planning and Management 24	3
Design of recreation environments, Environmental Planning and Management 136	3
Landscape construction, Environmental Planning and Management 154A, 154B, 154C	11
Landscape architecture, Environmental Planning and Management 182A, 182B, 182C	12
Individual requirements	17‡
Unrestricted Electives	27-30
Total Units for the Major	180

Major Adviser: R. L. Thayer (*Environmental Horticulture*).

Courses in Environmental Planning and Management

Questions pertaining to the following courses should be directed to the instructor or to the Environmental Planning and Management advising office, TB-105.

Lower Division Courses

- 20. Introduction to Landscape Architecture** (3) I, Thayer
Lecture—3 hours. History, theory, philosophy, techniques, and applications of landscape architecture in the design of outdoor spaces and land areas. Open to non-majors.
- 22. Landscape Architecture Studio** (3) I, II. The Staff
Lecture—1 hour; studio—6 hours. Prerequisite: course 20; Design 21 or the equivalent recommended. Introductory problems in landscape architectural analysis, design evaluation, and presentation methods. Limited enrollment.
- 24. Landscape Graphics and Delineation** (3) III. The Staff
Lecture—1 hour; studio—6 hours. Prerequisite: Design 21 or the equivalent. Laboratory work in graphic representation of landscapes and the outdoor environment, to include sketching, rendering techniques, landscape drawing, lettering, color use, presentation drawings, and portfolio preparation.
- 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** (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

- 110. Urban and Regional Planning** (4) II. Gold
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.

- *116. Outdoor Recreation** (4) I, Gold
Lecture—3 hours; discussion—1 hour. History, nature, scope, and significance of outdoor recreation in American life, with emphasis on user-resource relationships, special problems, policy issues, and innovation.

- 122. Park Administration** (4) II.
Lecture—3 hours; discussion—1 hour. Saturday field trip. Prerequisite: course 116. Description and analysis of the nature, concepts and techniques of providing leisure opportunities with emphasis on the policies, programs, and organization of park and recreation systems.

- 125. Technology Transfer and Innovation** (4) I, Hodgson
Lecture—3 hours; discussion—1 hour. Prerequisite: Rhetoric 1 or 3 and English 1. Students learn to reason from technology transfer, innovation diffusion, and organizational communication principles to develop communication strategies to introduce new ideas such as energy conservation, agricultural practices, etc., into social systems.

- 127. Leisure Behavior** (4) III.
Lecture—2 hours; discussion—2 hours. Prerequisite: course 116; course 125 recommended. Investigation of selected leisure environments and resultant behavior. Analysis of leisure behavior from a motivational base. Historical analysis of different leisure environments cross-culturally.

- 129. Research Methods for Planning and Management** (4) II.
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Statistics 13. Applying survey research design and measurement methodology to collection of data needed for planning and managing the environment. Processing and analysis of data using computer facilities. Developing the ability to evaluate published research results.

- 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.

- 136. Design of Recreation Environments** (3) III. The Staff
Lecture—2 hours; laboratory—3 hours; one Saturday field trip. Prerequisite: courses 20 and 22. Concepts, principles, techniques, problems, and potentials in the design, analysis and evaluation of recreation environments with emphasis on public outdoor recreation resources, form and function, visual quality, and the implications of design alternatives on the urban and natural landscape.

- 144. Park and Landscape Management** (4) III. Harris
Lecture—3 hours; laboratory—3 hours; one all day field trip. Prerequisite: Environmental Horticulture 130A and/or 133 and Agricultural Economics 112 and/or course 122 recommended. Planning, implementation, and supervision of landscape and facility maintenance and operations emphasizing management approaches including employee involvement, resource inventory, task descriptions, time standards, scheduling, and monitoring. Familiarization with techniques and technology to develop, maintain, and operate landscaped and recreation facilities.

- 154A. Landscape Construction: Introduction** (3) III.
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 20, 22; Engineering 1 recommended. Analysis of the physical, mechanical, functional and aesthetic properties of materials used in landscape development with emphasis on construction techniques, methods and specifications. Limited enrollment.

- 154B. Landscape Construction: Site Engineering** (4) II. The Staff
Lecture—2 hours; studio—6 hours (two 4-hour sessions which comprise lecture, discussion, and studio work). Prerequisite: course 154A. Topographic and grading problems in landscape engineering: drainage plans, sections and profiles, grading plans, spot elevations, and cut and fill calculations. Limited enrollment.

- 154C. Landscape Construction: Details** (4) III. The Staff
Lecture—2 hours; studio—6 hours (two 4-hour sessions which comprise lecture, discussion, and studio work). Prerequisite: course 154B. Advanced study of materials and construction methods, construction specifications, and irrigation systems. Emphasis on construction details for landscape developments. Limited enrollment.

- 160A. Environmental Interpretation Principles** (3) I, Hodgson
Lecture—3 hours. Prerequisite: Rhetoric 1 or 3 and English 1 or 104 recommended. Applications of communication theories and principles to environmental interpretation with emphasis on park and recreation interpretation, museums, historic areas, botanical and zoological gardens. Emphasis on reasoning to interpretive strategies from theory and principles.

- 160B. Environmental Interpretation Methods** (3) II. The Staff
Lecture—1 hour; laboratory—6 hours (3 hours to be arranged). Prerequisite: course 160A; English 104 recom-

†Minimum units are indicated. If more units are taken in order to meet this unit requirement, the extra units may be counted as individual requirements if approved by an adviser. Additional courses in the same subject to be used as individual requirements must be approved by an adviser.
‡Courses are selected to complement each student's program option in this major. The list of courses to be used as individual requirements must have the adviser's approval no later than Winter Quarter of the junior year.

NOTE: For key to footnote symbols, see page 130.

mended. Interpretation development and operations. Students learn to plan, produce, present, maintain and evaluate interpretive programs. Includes instruction in the use of selected interpretive media.

182A. Landscape Architecture: Planning and Analysis (4) I, The Staff

Lecture—2 hours; studio—6 hours (two 4-hour sessions which commingle lecture, discussion, and studio). Prerequisite: courses 154A, 154B, 154C or consent of instructor. Senior landscape architecture studio to include: solution of large-scale landscape architectural problems with emphasis on landscape planning and analysis methods and environmental concerns. Development of master plans and preliminary design concepts also included. Limited enrollment.

182B. Landscape Architecture: Site Planning (4) II, The Staff
Lecture—2 hours; studio—6 hours (two 4-hour sessions which commingle lecture, discussion, and studio). Prerequisite: course 182A or consent of instructor. Senior landscape architecture studio to include: exploration of problems in site design of intermediate-scale landscape developments dealing with multiple land use applications. Limited enrollment.

182C. Landscape Architecture: Intensive Design (4) III, The Staff
Lecture—2 hours; studio—6 hours (two 4-hour sessions which commingle lecture, discussion, and studio). Prerequisite: course 182B or consent of instructor. Senior landscape architecture studio to include: solution of intensive, small-scale landscape architectural problem with emphasis on the integration of production design, working drawings, and construction implementation documents. Limited enrollment.

192. Internship in Environmental Planning and Management (1-12) I, II, III, The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: upper division or graduate standing, completion of upper division coursework relevant to the internship topic and consent of instructor. Students apply theory and principles learned in classroom instruction to applied problems under supervision of both a faculty adviser and a professional sponsor. Students must consult with a faculty adviser before applying for an internship. (P/NP grading only.)

196. Environmental Planning and Management Study Tour (4) I, Hodgson
Field trips—6-10 hours per day; evening seminar session (2 to 3 weeks following trip). Prerequisite: course 110 or 116; consent of instructor. Study tour, 14 to 17 days prior to the beginning of fall quarter. Observe, analyze and evaluate the planning, design, management and programs of recreation and other urban environments with emphasis on administrative processes, interpretive methods, program innovations. (Reservations required in May preceding Fall Quarter.) (P/NP grading only.) Offered in even-numbered years.

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: 3 units of upper division work in park administration; consent of instructor. (P/NP grading only.)

Graduate Courses

222. Recreation Policy (3) II.
Lecture—3 hours. Prerequisite: course 122 or consent of instructor. Analysis of the development and application of public policy of recreation resource allocation, development and management. Offered in even-numbered years.

***234. Recreation Planning (4) III, Gold**
Lecture—2 hours; discussion—1 hour; laboratory—3 hours; one Saturday field trip. Prerequisite: courses 110, 116, 122, 134 or consent of instructor. Application of basic and advanced concepts, techniques and methods used to prepare park, recreation and open space plans for urban environments. Offered in odd-numbered years.

290. Seminar (1-2) I, II, III, The Staff (Chairperson in charge)
Seminar—1-2 hours. An interdisciplinary seminar on selected current topics related to environmental planning, leisure behavior and environmental quality.

299. Research (1-6) I, II, III, The Staff (Chairperson in charge)
Research—3-18 hours. (S/U grading only.)

Environmental Policy Analysis and Planning

(College of Agricultural and Environmental Sciences)

The Major Program

Environmental Policy Analysis and Planning seeks to develop an understanding of both techniques for evaluating, and the factors affecting, governmental policy-making in a variety of fields related to environmental quality. This major is designed to produce students with (1) a general background in the natural sciences relevant to environmental policy; (2) sufficient training in mathematics, statistics, and research methodology to quantitatively analyze environmental problems and policy options; (3) a strong background in the field of policy analysis, involving both the evaluation of policy alternatives and an understanding of the factors affecting policy formulation and implementation by governmental institutions. In addition, students will be encouraged to develop (4) substantive knowledge in a specific field of environmental policy such as air pollution control, water resources management, urban and regional planning, or energy development.

The major is oriented toward both (1) terminal students who will acquire the analytical skills and broad background in the social and natural sciences needed for employment in public agencies, consulting firms, and businesses concerned with environmental affairs, and (2) preprofessionals who will go on to graduate work in law, planning, public policy, or environmental science having both a wide background in the social and natural sciences and a fairly extensive background in a functional policy area. It is anticipated, however, that most career-oriented graduates will eventually seek an advanced degree.

The course requirements are designed to provide both the basic substantive knowledge and analytical skills necessary for a quality program in environmental policy analysis and planning. Although certain courses are stipulated for all students involved in the program, the emphasis is on required units within categories of courses. This recognizes the wide variety of students' interests and the changing content and quality of specific courses from year to year. It is very important, however, that students develop a close relationship with their own advisers in order that the preparatory and depth courses selected be appropriate to each student's interests and desired area of specialization.

Environmental Policy Analysis and Planning

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.)

	UNITS
Preparatory Subject Matter†	41-46
Mathematics (Mathematics 16A, 21A)	3-4
Statistics (Statistics 13, 32)	3-4
Physics (Physics 1A, 2A, 10)	3-4
Chemistry (Chemistry 1A, 1B)	10
Biology (Biological Sciences 1)	5
Environmental science and agriculture (Soil Science 2; Water Science 2; Botany 2; Zoology 2; Agronomy 21; Agricultural Economics 1; Geology 1;	

†These are minimum requirements. Additional courses may be necessary to meet prerequisites for upper division courses in some areas of specialization.

Plant Science 1; Animal Science 1;	
Water Science 104)	3-5
American politics (Political Science 1, 5)	4
Micro- and macro-economics (Economics 1A, 1B)	10
Breadth Subject Matter	19-20
Communication skills (see College requirement, page 70)	8
Psychology (Psychology 1, 16, 144, 145)	3-4
Social sciences and humanities electives‡	8

Depth Subject Matter 52-53

(a) Core Courses	
Policy analysis (Environmental Studies 160)	4
Law (Environmental Studies 161 or 173)	4
Bureaucratic policymaking (Environmental Studies 166)	4
Policy evaluation (Environmental Studies 168A)	4
Environmental planning and impact assessment (Environmental Studies 171 or 179)	3-4
Human ecology (Environmental Studies 101)	4
Environmental science (Environmental Studies 110)	4
(b) Research Methods	
Ethics and normative reasoning (Philosophy 114A, 117)	4
Research design (Environmental Studies 145; Sociology 103; Environmental Planning and Management 129)	4-5
Statistics (Sociology 106; Political Science 114; Agricultural Economics 106A)	4
(c) Economic Analysis	
Microeconomics (Economics 100)	5
Urban and public economics (Economics 125A, 125B or 131)	4
Resource economics (Agricultural Economics 176)	3

Area of Specialization 16-21

City and Regional Planning Option

Architecture (Art 168, 184, 188B)	4
Urban geography (Geography 155, 156)	4
Transportation and civil engineering planning (Civil Engineering 152, 160)	3
Landscape analysis for planning (Environmental Planning and Management 182A)	4
Aerial photography and cartography (Geography 105, 106)	4

Water Quality Planning Option

Environmental health (Environmental Studies 126)	4
Water pollution (Water Science 41, 103, 180)	3-4
Hydrology (Water Science 141)	3
Water law (Water Science 150)	3
Wastewater treatment (Civil Engineering 148A)	3
Project evaluation (Agricultural Economics 148)	3

Air Pollution Control Policy Option

Environmental health (Environmental Studies 126)	4
Aerosol toxicology (Environmental Toxicology 131)	3
Pollution control (Civil Engineering 149)	3
Meteorology (Atmospheric Science 123, 131)	7
Fluid mechanics (Engineering 103A)	3

Energy Policy Option

Environmental health (Environmental Studies 126; Environmental Toxicology 131)	3-4
Nuclear hazards (Environmental Studies 115)	3
Solar technology (Engineering 160 and 162)	7
Energy (Resource Sciences 103)	3
Additional courses with consent of adviser	3-4

‡Units earned in satisfaction of American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Environmental Science Option

Environmental health (Environmental Studies 126; Environmental Toxicology 101)	3-4
Soils and land use (Soil Science 118; Geology 134)	3-4
Aquatic systems (Environmental Studies 116, 151; Water Science 41, 103, 141, 180)	3-4
Meteorology and air pollution (Atmospheric Science 123, 131; Civil Engineering 149)	3-4
Science policy (Environmental Studies 165)	4

Advanced Policy Analysis Option

Political institutions (Political Science 102, 105, 108, 159; 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 Engineering 153, 160; Agricultural Economics 148; Economics 130)	3-4

Unrestricted Electives 40-52

Students will be urged to take internships, when appropriate to their educational needs. Also, computing (Engineering 5A; Mathematics 19, 29) will be recommended.

Total Units for the Major 180

Major Adviser. R.A. Johnston (Environmental Studies).

Harry O. Walker, Ed.D., Senior Lecturer (*Land, Air and Water Resources*)
 Geoffrey A. Wandesforde-Smith, Ph.D., Associate Professor (*Environmental Studies, Political Science*)
 Kenneth E. F. Watt, Ph.D., LL.D., Professor (*Zoology*)
 James E. Wilen, Ph.D., Associate Professor (*Environmental Studies, Agricultural Economics*)

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 a Bachelor of Science degree in *Environmental Policy Analysis and Planning* (see page 204). 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 Letters and Science and the College of Agricultural and Environmental Sciences (see page 230).

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.

Elective Programs in Environmental Studies. Students from a variety of majors may wish to focus their electives in Environmental Studies. To aid students in identifying coherent groups of courses that build theory and research skills and complement their disciplinary majors, three suggested elective programs appropriate for natural scientists, social scientists, and environmental professionals are listed below. These *example* programs are merely indicative; in order to increase the effectiveness of your program and to get the most out of your elective units, you should consult with appropriate Environmental Studies faculty before taking courses.

Ecological Analysis

This study program is intended for natural science students desiring a focus in ecology and its application in resource analysis. These courses develop theoretical and analytical skills, including laboratory or field work.

- Environmental Studies 100 (general ecology)
- Environmental Studies 121 (population ecology)
- Environmental Studies 122 (analysis of ecological communities)
- Zoology 149 (evolution of ecological systems)
- Environmental Studies 123 (introduction to field and laboratory methods in ecology) 151L (limnology laboratory), or Zoology 228 (experimental animal ecology)

Subspecializations are as follows:

- (a) Behavioral Biology
 Environmental Studies 125 (social systems of animals and humans); Psychology 150 (comparative psychology); Anthropology 154A-154B (primate behavior and ecology)
- (b) Aquatic Ecology
 Environmental Studies 151 (limnology); Environmental Studies/Geology 116 (the oceans), 150A (physical and chemical oceanography), 150B (geological oceanography), 150C (biological oceanography); Water Science 41 (ecology of polluted waters)
- (c) Ecology of Taxa
 Botany 117 (plant ecology); Zoology 125 (animal ecology); and others
- (d) Simulation and Modeling
 Environmental Studies 128 (analysis and simulation of complex systems), 129 (the dynamics and simulation of ecological systems); Wildlife and Fisheries Biology 122 (dynamics of exploited animal populations)

Environmental Policy Analysis

This program is suitable for both natural science and social science students, as well as professionals such as those in environmental planning and management or engineering who do not wish to take the major in Environmental Policy Analysis and Planning. This set of courses develops theoretical and analytical skills in political, economic, and legal analysis of public policies, plans, and programs that affect the environment. Intermediate microeconomics should be taken before Environmental Studies 168A and Agricultural Economics 176.

Environmental Studies 160 (environmental decision making), Political Science 107 (environmental politics and administration), 108 (policy making in the public sector), or 109 (public policy and the Governmental process)

Environmental Studies 166 (case studies in administrative failure and reform), Political Science 181 (the American administrative system), or 182 (administrative decision making and public policy)

Environmental Studies 161 (environmental law), 173 (public mechanisms for controlling land use), or Water Science 150 (water law and water institutions)

Environmental Studies 171 (environmental planning), 179 (environmental impact reporting), or Environmental Studies/Zoology 110 (principles of environmental science)

Agricultural Economics 147 (natural resource economics), or 176 (economic analysis in resource use)

Environmental Studies 168A (methods of environmental policy evaluation) and 168B (methods of environmental policy analysis)

Environmental Studies 165 (science, experts, and public policy) for natural science and engineering students.

Cultural Ecology

This program is for social science and natural science students interested in the interactions between human populations and their environments and in cross-cultural comparisons. Students seeking future work in rural development, public health, overseas environmental management, and graduate work in human ecology, anthropology, economics, or sociology will find this program useful. Several disciplines are synthesized here.

Environmental Studies 100 (general ecology) or Zoology 125 (animal ecology)
 Environmental Studies/Anthropology 101 (principles of human ecology)

Environmental Studies

(Intercollege Division)

Francisco J. Ayala, Ph.D., Chairperson of the Division and Associate Dean of Environmental Studies

Peter J. Richerson, Ph.D., Associate Director

Division Office, 2132 Wickson Hall (752-3026)

Faculty

Francisco J. Ayala, Ph.D., Professor (*Genetics*)

Paul P. Craig, Ph.D., Professor (*Engineering: Applied Science*)

James C. Cramer, Ph.D., Assistant Professor (*Sociology*)

William G. Davis, Ph.D., Associate Professor (*Anthropology*)

Theodore C. Foin, Jr., Ph.D., Associate Professor

John H. Gillespie, Ph.D., Professor (*Environmental Studies, Genetics*)

Charles R. Goldman, Ph.D., Professor

Marvin Goldman, Ph.D., Professor (*Radiological Sciences*)

²William J. Hamilton III, Ph.D., Professor

James A. Harding, Ph.D., Professor (*Environmental Horticulture*)

Robert A. Johnston, M.S., Associate Professor

Jess F. Kraus, Ph.D., Associate Professor (*Community Health*)

Leonard O. Myrup, Ph.D., Professor (*Land, Air and Water Resources*)

¹Benjamin S. Orlove, Ph.D., Associate Professor

Thomas M. Powell, Ph.D., Associate Professor

³Peter J. Richerson, Ph.D., Associate Professor

Paul A. Sabatier, Ph.D., Associate Professor

Seymour I. Schwartz, Ph.D., Associate Professor

NOTE: For key to footnote symbols, see page 130.

Environmental Studies

Environmental Studies/Anthropology 141 (cultural ecology) and Environmental Studies 141L (laboratory and field methods in cultural ecology)
Economics 100 (intermediate micro theory) or Anthropology 122 (economic anthropology)
Environmental Studies/Community Health 126 (introduction to environmental health)
Environmental Studies 145 (population analysis)
Environmental Studies 125 (social systems of animals and humans) or Anthropology 154A (primate behavior and ecology)

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 departments with which they are associated, such as 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. R. M. Love (*Ecology*).

Courses in Environmental Studies

Lower Division Courses

10. Introduction to Environmental Studies (4) I, III. The Staff
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.

20. Energy: Options and Issues (3) I, III. Walker
Lecture—3 hours. A comparison of energy conversion principles for nuclear, geothermal, hydro, fossil fuel, and solar generating units. Discussion of energy reserves, potential resources, environmental consequences of use, siting, demand forecasts, transmission, energy-social-GNP relationships.

20L. Energy: Options and Issues Laboratory (2) I, Walker
Discussion—1 hour; laboratory—3 hours. Prerequisite: course 20 (may be taken concurrently). On-site study programs and representative types of energy conversion units, includes hydroelectric, geothermal, fossil fuel, and nuclear facilities. Saturday trips primarily.

25. Environmental Policy (3) III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: introductory courses in microeconomics, American politics, and ecology recommended. An introduction to the economic and political analysis of environmental policy issues dealing with pollution control, renewable resources, land use, and energy. Focus on California and the U.S., with some attention to international problems.

30. The Global Ecosystem (3) III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: Biological Sciences 1 or Geography 1 or consent of instructor. The course will focus upon how the interaction of climate and biotic adaptation produces ecological systems. It will then examine the limits and opportunities for human use of different natural environments, as well as more general questions of human utilization for the earth's biotic resources.

***39. Animal Societies** (4) III. Hamilton
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1. Significance of the study of animal societies to an understanding of human, social and economic conventions. Aggression, competition, cooperation, communication and sexual behavior are contributions from an evolutionary perspective.

92. Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn 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. The Staff
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. Principles of Human Ecology** (4) II. Davis, Richerson
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 or 10; Sociology 1 or Anthropology 2 recommended. An examination of the critical variables in the processes that related man to his environment. Emphasis on the biological, cultural, social, and psychological forces which encourage stability or change in human ecological relationships. (Same course as Anthropology 101.)

108. Philosophy of the Biological Sciences (4) III. Ayala
Lecture-discussion—4 hours. Prerequisite: a major in a biological science or one philosophy course. Scientific method in biology. Nature of biological theories, explanations, and models. Problems of evolutionary theory, ecology, and sociobiology. Bio-engineering and environmental ethics. (Same course as Genetics 108 and Philosophy 108.)

(a) Environmental Science

110. Principles of Environmental Science (4) II. Powell
Lecture—3 hours; discussion—1 hour. Prerequisite: one course in the biological sciences and one course in the physical sciences. The principles basic to biological ecology, human ecology, and planning. (Same course as Zoology 110.)

***111. Environmental Chemistry** (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 1C and 8B, course 10, and Biological Sciences 1, or consent of instructor. The practical application of chemistry provides a basis for understanding and describing the environmental roles of physical and chemical processes and their possible ecological perturbations. Topics will include ecosystem cycling, descriptions of natural chemical processes, and ecological effects of chemical pollutants. Offered in even-numbered years.

115. Bioenvironmental Consequences of Nuclear Technology (3) III. M. Goldman
Lecture—2 hours; discussion—1 hour; field trip to nuclear power station. Prerequisite: consent of instructor; Physics 2A and Biological Sciences 1, or the equivalent. Discussion of biospheric implications of radionuclide and thermal effluents generated by nuclear technology. Hazards evaluation based on the prediction of the response of the most sensitive physiological systems will be emphasized. (Same course as Radiological Sciences 115.)

116. The Oceans (3) II. Powell, Ward (Geology)
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; man's utilization of marine resources. (Same course as Geology 116.)

118. Mineral Elements in Food Chains (2) I, Burau, Epstein and Rendig (Land, Air and Water Resources)
Lecture—2 hours. Prerequisite: Chemistry 1B and one course each in biological sciences and earth science, or consent of instructor. Sources of mineral nutrients, their progression through food chains, and their importance in plants, animals and human life support systems; the effects of man's activities on mineral nutrient cycling and utilization. Guest lecturers on some topics. (Same course as Resource Sciences 118.)

(b) Ecological Analysis

121. Population Ecology (4) I, Harding
Lecture—3 hours; discussion—1 hour. Prerequisite: Botany 2, Zoology 2-2L, 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 on solving problems.

122. Analysis of Community Dynamics (4) II. Foin
Lecture—3 hours; discussion—1 hour. Prerequisite: one course in elementary ecology (course 100, Zoology 125, Entomology 104, Botany 117, or the equivalent); elementary statistics and calculus strongly recommended. Course examines the theory of community ecology from an analytical point of view. Topics covered include energy and material flows, community organization homeostasis, and evolution. Emphasis is placed on systems ecology and the impact of man on ecological systems.

***123. Introduction to Field and Laboratory Methods in Ecology** (4) I. 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.

125. Social Systems of Animals and Humans (4) II. Hamilton
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or the equivalent recommended. The nature and interpretation of animal social systems, and their relevance to an understanding of man's social conventions and evolution. Aggression dominance, communication, sexual behavior, cooperation and social regulation of density are considered from an evolutionary perspective.

126. Introduction to Environmental Health (4) I, Kraus
Lecture—3 hours; discussion—1 hour. Prerequisite: Community Health 101 or introductory course in biological science. Problems in environmentally dependent aspects of individual and public health. Diseases associated with pollution of air, water, soil and food: Zoonoses such as malaria, plague, rabies, and hazards of certain occupational environments. (Same course as Community Health 126.)

127. Contemporary Problems in Environmental Health (3) II. Kraus
Lecture—2 hours; discussion—1 hour. Prerequisite: Environmental Studies/Community Health 126 or consent of instructor. Contemporary problems and issues in environmentally dependent aspects of health. Diseases and injuries from environmental carcinogens, teratogens, pesticides, noise, radiation, consumer products, stress phenomena, and heavy metals are considered. (Same course as Community Health 127.)

128. Analysis and Simulation of Complex Systems (5) I, Foin
Lecture—4 hours; discussion—1 hour. Prerequisite: computer programming (FORTRAN or ALGOL), calculus, and statistics. Techniques of analysis, model-building, and simulation of ecological and socioeconomic systems will be explored, with emphasis on applications to environmental problem-solving. Students will be introduced to stimulation languages and will apply their training in individual or team projects.

***129. The Dynamics and Simulation of Ecological Systems** (3) I, Foin
Lecture-seminar—4 hours. Prerequisite: calculus, statics, and elementary ecology. An advanced course in ecology. Lectures are given as needed, but are replaced with seminars prepared by all students with the emphasis on current controversies in ecology and the potential role of mathematical models in their solution. Limited enrollment.

(c) Cultural Ecology

141. Cultural Ecology (4) III. Orlove
Lecture—3 hours; discussion—1 hour. A comparative survey of the interaction between diverse human cultural systems and the environment of the peoples that practice them. Primary emphasis is given to people living in rural and relatively undeveloped environments as a basis for interpreting more complex environments. (Same course as Anthropology 141.)

***141L. Laboratory and Field Methods in Cultural Ecology** (3) I, Orlove
Discussion—1 hour; laboratory—6 hours; field—1-6 hours. Prerequisite: course 101. Environmental Studies/Anthropology 141 (may be taken concurrently). Collection of field data in human ecology (quantitative measurements and estimates, interviews). Laboratory analysis of statistical data and interviews. Emphasis on energetics and productive systems. Offered in even-numbered years.

142. Culture and Environmental Perception (4) II. The Staff
Lecture—3 hours; individual research project. An examination of man's relationship to the environment through the study of culture. The nature of subjective models and their impact upon environmentally oriented behavior. Focuses upon classification and decision making. (Same course as Anthropology 142.)

145. Population Analysis (4) I, Cramer
Lecture—3 hours; laboratory—3 hours. A comparative and historical examination of interrelations between population dynamics and social organization, technology, and the environment; statistical analysis of the relation of demographic processes of fertility, mortality, and migration of variations and changes in human population size, composition, and distribution. Offered in even-numbered years.

(d) Aquatic Ecosystems Analysis

150A. Physical and Chemical Oceanography (4) I, Powell
Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies/Geology 116, Physics 8C, 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. Cowen. Lipps (Geology)
Lecture—3 hours. Prerequisite: Geology 50 or 116. Introbasins. Composition and structure of oceanic crust; marine volcanism; and deposition of marine sediments. Interpretation of geologic history of the ocean floor in terms of seafloor spreading theory. (Same course as Geology 150B).

150C. Biological Oceanography (3) III. The Staff
Lecture—3 hours. Prerequisite: Biological Sciences 1 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.)

151. Limnology (4) III. C. Goldman
Lecture—3 hours; discussion—1 hour; special project. Prerequisite: Biological Sciences 1 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.

(e) Environmental Policy Analysis

160. Environmental Decision Making (4) III. Schwartz, Wandesforde-Smith
Lecture—3 hours; discussion—1 hour. A survey and examination of approaches and concepts in decision making relevant to environmental problems. Discussion of collective action, problems of institutional design, the implications of public sector entrepreneurship, and the effects of technology on alternative decision structures.

161. Environmental Law (4) II. Wandesforde-Smith
Lecture—4 hours; discussion—1 hour. 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.

***162. Planning and Decision Making in Small Urban Communities** (4) III. Sgklow (Political Science)
Lecture-discussion—4 hours. Examination of urban processes in small U.S. communities, with particular attention to how local governments respond in their structures and programs to community growth, or non-growth, and development. The political consequences of excessive subdivision development, overburdened utility plants, and alternative taxation strategies.

165. Science, Experts, and Public Policy (4) II. Sabatier
Lecture—4 hours. Factors affecting the influence of scientists, planners, and other experts in policy-making. Several cases and controversies will be examined.

166. Case Studies in Institutional Failure and Reform (4) I, Sabatier
Lecture-discussion—4 hours. Prerequisite: course 160, Political Science 107, or a course in American politics recommended. Discusses selected cases of alleged failure by administrative agencies dealing with environmental problems. Examines a number of causes and alternative reforms. Course also explicitly seeks to improve the ability of students to critically examine written materials.

168A. Methods of Environmental Policy Evaluation (4) II. Schwartz
Lecture—3 hours; discussion—1 hour. Prerequisite: Statistics 13 (or the equivalent), Economics 1A or Agricultural Economics 147. Examination of issues, concepts and methods applicable to environmental policy evaluation. Topics include analysis of information needs, data availability, and research strategies appropriate for policy evaluation models; benefit-cost analysis, policy impact assessment, multi-objective evaluation, and policy implementation.

***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. Student will apply the methods and concepts by means of a major project.

(f) Environmental Planning

171. Environmental Planning (4) II. Johnston
Lecture—4 hours. Prerequisite: course 10, one course each in biology, earth science, economics, social science, and humanities. Laws, institutions, procedures, design and analysis methods, and means of implementation of planning for land use, air and water quality and energy are examined. Theoretical and practical readings are used.

***172. Theories of the Planning Process** (4) III. Johnston
Lecture—2 hours; discussion—2 hours. Prerequisite: completion of at least one of the following: course 171, Environmental Planning and Management 110, courses 168A, 168B, 173. Competing theories of the role of planning in Western society are examined. Problems of optimum degree of economic regulation and of limited information are discussed. Applicable to land use, transportation, waste water, water resources, air quality, and social services planners.

173. Public Mechanisms for Controlling Land Use (4) II. Johnston
Lecture-discussion—3 hours; laboratory—3 hours. Prerequisite: an introductory course in planning. 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.

179. Environmental Impact Reporting (3) III. Johnston
Lecture—2 hours. Prerequisite: upper division standing. Methods of analysis useful 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 Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn 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. Directed study of a topic selected by the student and the 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 odd-numbered years. (Same course as Ecology 212A)

212B. Environmental Policy Analysis: Evaluation (4) I, Cramer, Schwartz, Wilen
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 odd-numbered years. (Same course as Ecology 212B.)

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)

James N. Seiber, Ph.D., Chairperson of the Department
Department Office, 109 Environmental Toxicology (752-1142)

Faculty

Thomas E. Archer, B.A., Lecturer
Richard G. Burau, Ph.D., Associate Professor
James L. Byard, Ph.D., Assistant Professor
Donald G. Crosby, Ph.D., Professor
Gerald L. Fisher, Ph.D., Adjunct Associate Professor
Gary L. Henderson, Ph.D., Associate Professor
Dennis P. H. Hsieh, Sc.D., Ph.D., Professor
Wendell W. Kilgore, Ph.D., Professor
Robert I. Krieger, Ph.D., Associate Professor
Ming-yu Li, Ph.D., Lecturer
James N. Seiber, Ph.D., Professor
Takayuki Shibamoto, Ph.D., Assistant Professor
Wray W. Winterlin, M.S., Lecturer
Dorothy E. Woolley, Ph.D., Professor

The Major Program

Environmental Toxicology deals with the properties, fate, biological effects, detection and regulation of natural and man-made toxicants present in the environment. Toxicants studied in the major include pesticides, pollutants, industrial chemicals, and poisons produced by microbes, plants, and animals. The objective of the major is to provide training which will enable students to apply the principles of the physical and biological sciences to the study of toxicants as a basis for solving problems occasioned by the presence of toxicants in the environment. Through the appropriate choice of electives, students have the opportunity to specialize in any one of several areas of environmental toxicology. Students electing to emphasize the application of the physical sciences to the study of toxicants would qualify for positions in residue analysis, environmental monitoring and forensic toxicology. Those electing to emphasize the application of the biological sciences to the study of toxicants would qualify for positions in animal toxicology, environmental health and safety, and pest control. The major can also serve as preparation for graduate or professional school.

Prospective majors must contact the major adviser before April 1 of their sophomore year. Enrollment in this major may be limited. Applicants for this major will be admitted to the Exploratory Program.

Environmental 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 will be accepted. *Courses shown without parentheses are required.*)

	UNITS
Preparatory Subject Matter	59-63
Biological sciences (Biological Sciences 1)	5
Other biological sciences (entomology, zoology, botany, bacteriology, physiology)	10-12
General chemistry (Chemistry 1A-1B-1C)	15
Organic chemistry (8A-8B or 128A-128B)	6
Environmental science (Environmental Toxicology 10 or Environmental Studies 10)	4
Mathematics (Mathematics 16A-16B or 21A-21B, 19, Statistics 13)	13-15
Physics (Physics 1A-1B or 2A-2B)	6
Depth Subject Matter	56
Biochemistry (Biochemistry 101A, 101B)	6
Organic chemistry (Chemistry 128A, 128B or 128C)	3
Environmental Toxicology 101, 112A, 112B, 114A, 114B, 138 (130A-130E, 131, 132)	23
Electives selected for area of specialization with adviser's approval	24
Breadth Subject Matter	50
English and/or rhetoric (See College requirements)	8
Social sciences and humanities electives†	12
Electives selected with adviser's approval to complement program options: courses in agricultural economics, environmental studies, sociology, political science, and psychology are particularly recommended	30
Unrestricted Electives	21-26
Total Units for the Major	180

Major Adviser. R.I. Krieger.

Information Center for the major, 122 Hoagland Hall.

Related Courses. See Atmospheric Science 131, Environmental Studies 10, 121.

Courses in Environmental Toxicology

Lower Division Courses

10. Introduction to Toxicology (4) III. Krieger
Lecture—3 hours; discussion, seminars, field trips, laboratory demonstrations—2 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 (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn 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 (Seiber in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Principles of Environmental Toxicology (3) I, Shibamoto
Lecture—3 hours. Prerequisite: Chemistry 8B or 128C (or the equivalent); Biochemistry 101A recommended. A unified introduction to principles underlying the use and environmental consequences of pesticides, food additives, and other chemicals; their regulations; and their health significance.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

112A. Toxicants in the Environment (3) II. Crosby, Shibamoto
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. Burau, Seiber
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 112A and consent of instructor. Continuation of 112A. Toxic chemicals—primarily pollutants—in the environment; concepts of 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. Byard
Lecture—3 hours. Prerequisite: Biochemistry 101B (may be taken concurrently); course 101 and Physiology 101 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: Comparative Aspects (4) III. Henderson, Byard, Kilgore
Lecture—1 hour; discussion—2 hours; laboratory—3 hours. Prerequisite: course 114A and consent of instructor. Course designed to illustrate basic principles of toxicology and to acquaint 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.

130A-E. Selected Topics in Environmental Toxicology (3) I, II, III. The Staff (Seiber 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 foods, and the safe handling of toxic substances.

131. Air Pollutants and Inhalation Toxicology (3) I, III. Hsieh
Lecture—3 hours. Prerequisite: Chemistry 8B (may be taken concurrently) or the equivalent; Biochemistry 101A 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. Offered in even-numbered years Spring Quarter.

132. Chromatography for Analytical Toxicology (3) II. Archer
Discussion—1 hour; laboratory—6 hours. Prerequisite: Chemistry 8B (may be taken concurrently) or the equivalent; consent of instructor. Introduction to, including application and theory of, basic chromatographic techniques such as thin-layer, gas-liquid, high-pressure liquid and column chromatography useful for analytical toxicology. Limited enrollment; preference given to Environmental Toxicology majors.

138. Legal Aspects of Environmental Toxicology (3) I, LI
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.

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.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn 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.)

197T. Tutoring in Environmental Toxicology (1-5) I, II, III. The Staff (Seiber 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 (Seiber in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Seiber in charge)
(P/NP grading only.)

Graduate Courses

200. Mammalian Toxicology (4) III. Byard
Lecture—3 hours; discussion—1 hour (alternate weeks); laboratory—4 hours (alternate weeks). Prerequisite: course 114A, and consent of instructor. Fate, mechanism of action and symptomatology of toxicants in mammals. Limited enrollment; preference given to students in Pharmacology and Toxicology and Environmental Pathology.

203. Environmental Toxicants (4) II. Crosby
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.

214. Mechanisms of Toxic Action (3) II. Kilgore
Lecture—3 hours. Prerequisite: Biochemistry 101A-101B and consent of instructor. Biochemical and physiological mechanisms underlying toxicity and detoxification. Offered in even-numbered years.

220. Analysis of Toxicants (3) I. Seiber
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, Seiber
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.

234. Neurophysiological Basis of Neurotoxicology (2) II. Woolley
Lecture—1½ hours; discussion—½ hour. Prerequisite: Physiology 101 or the equivalent, consent of instructor. Mechanisms of action of a number of different neurotoxins, including marine toxins, insecticides and heavy metals. Examples of ways toxins may act on the nervous system and techniques for study of neurotoxicology. (Offered in odd-numbered years.) (Same course as Physiology 234.)

290. Seminar (1) I, II, III. The Staff (Seiber in charge)
Seminar—1 hour. Current topics in environmental toxicology. (S/U grading only.)

297T. Tutoring in Environmental Toxicology (1-5) I, II, III. The Staff (Seiber 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. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Seiber in charge)
Prerequisite: consent of instructor. Topics such as trace analysis of toxicants, natural toxicants, and new pesticides.

299. Research (1-12) I, II, III. The Staff (Seiber in charge)
(S/U grading only.)

Epidemiology and Preventive Medicine

(School of Veterinary Medicine)

Hans P. Riemann, D.V.M., Ph.D., Chairperson of the Department

Department Office, 112 Surge IV

Faculty

Henry E. Adler, D.V.M., Ph.D., Professor
 Raymond A. Bankowski, D.V.M., Ph.D., Professor Emeritus
 Nemat O. Borhani, M.D., M.P.H., Professor (Internal Medicine, Community Health)
 Robert B. Bushnell, D.V.M., Lecturer
 Fred N. Cooper, B.S.P.H., Lecturer
 Paul D. DeLay, D.V.M., Lecturer
 Thomas B. Farver, Ph.D., Assistant Professor
 Constantin Genigeorgis, D.V.M., Ph.D., Professor
 Jack A. Howarth, D.V.M. Ph.D., Professor
 George L. Humphrey, D.V.M., M.P.H., Lecturer
 Winifred E. Kistler, M.L.S., Lecturer
 Ming-yu Li, Ph.D., M.L.S., Lecturer
 Stewart H. Madin, D.V.M., Ph.D., Professor (Berkeley campus)
 Bryan Mayeda, D.V.M., Lecturer
 R. H. McCapes, D.V.M., Lecturer
 Marjan Merala, M.S., Ldo. Vet., Lecturer
 Margaret E. Meyer, Ph.D., Professor
 Nicholas L. Petrakis, M.D., Professor (San Francisco campus)
 William A. Priester, D.V.M., M.P.H., Adjunct Professor
 Hans P. Riemann, D.V.M., Ph.D., Professor
 Arnold S. Rosenwald, D.V.M., Ph.D., Lecturer
 Roger N. Ruppner, D.V.M., M.V.Sc., M.P.V.M., Assistant Professor
 Walter W. Sadler, D.V.M., M.P.H., Professor Emeritus
 Robert Schneider, D.V.M., M.S., Adjunct Associate Professor
 Calvin W. Schwabe, D.V.M., M.P.H., Sc.D., Professor
 Patton L. Smith, D.V.M., M.P.V.M., Lecturer
 George B. E. West, D.V.M., Lecturer
 Richard Yamamoto, Ph.D., Professor
 George K. York, Ph.D., Lecturer

Courses in Epidemiology and Preventive Medicine

Upper Division Courses

100. Preventive Veterinary Medicine: Orientation (4) I. The Staff (Farver in charge)
 Lecture—40 hours total. Prerequisite: enrolled in MPVM degree program. An introduction to the concepts basic to biostatistics and epidemiology. Overview of veterinary preventive medicine programs. (P/NP grading only.)

101. Perspective in Veterinary Medicine (2) II. Schwabe
 Lecture—2 hours. This course for preveterinary and veterinary students is a cultural introduction to veterinary medicine, including its history and present-day scope, with the emphasis upon the social responsibilities of veterinarians and the multiple career avenues available for their fulfillment. Offered in odd-numbered years. (P/NP grading only.)

102. Biomedical Information Retrieval (3) I. Kistler, Merala
 Lecture—1 hour; discussion—1 hour; laboratory—3 hours. The use of bibliographic tools in the biomedical sciences; forms of biomedical literature; sources of statistical and epidemiological data; computerized systems in literature retrieval; preparation of bibliographies.

103A. Medical Statistics I (3) I. Farver
 Lecture—2 hours; laboratory—3 hours. Prerequisite: Statistics 13 (or the equivalent) and consent of instructor. Use of statistics in clinical, laboratory, and population medicine; graphical and tabular presentation; introductory methods in regression and correlation; normal, t, F-, and chi-square distributions; elementary nonparametric methods.

103B. Medical Statistics II (3) II. Farver
 Lecture—2 hours; laboratory—3 hours. Prerequisite: course 103A or consent of instructor. Continuation of course 103A. Analysis of variance in biomedical sciences; time-dependent variation and trends; bioassay; introduction to mathematical epidemiology; nonparametric methods; biomedical applications of statistical methods.

103C. Medical Statistics III (3) III. Farver
 Lecture—2 hours; laboratory—3 hours. Prerequisite: course 103B or consent of instructor. Continuation of course 103B. Analysis of covariance; multiple regression; multivariate methods; life tables and cohort studies; problems in sampling and surveys; biomedical applications.

104. History of Veterinary Medicine (3) III. Schwabe
 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 the rational healing; and its contributions during the eighteenth-twentieth centuries to the creation of modern medicine. Offered in odd-numbered years.

111. Animal Hygiene (3) III. Howarth, McCapes
 Lecture—3 hours. Prerequisite: Biological Sciences 1 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.

150. Food-borne Infections and Intoxications (4) II. Genigeorgis, Riemann, York
 Lecture—4 hours. Prerequisite: Bacteriology 2. 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.

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
 (P/NP grading only.)

Graduate Courses

210A. Advanced Epidemiology (6) I. Schwabe, Ruppner
 Lecture—4 hours; discussion—2 hours. Prerequisite: a degree in veterinary medicine, medicine, or dentistry, or consent of instructor; course 103A (may be taken concurrently). Consideration of the principal approaches to the study of diseases in populations both of lower animals and of man, with critical discussions of illustrative case examples from "classical" and contemporary literature.

210B. Advanced Epidemiology (3) II. Riemann, Farver
 Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: courses 210A, and 103B (may be taken concurrently). Continuation of course 210A with emphasis on use of models and statistical methods in epidemiology. Introduction to animal health economics.

210C. Advanced Epidemiology (3) II. Riemann, Farver
 Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: courses 210B and 103C (may be taken concurrently). Continuation of course 210B with attention given to case control studies, cohort studies and the use of multivariate techniques in epidemiology.

211A. Applied Epidemiology I (3) I. Meyer
 Lecture—1 hour; discussion—2 hours. Prerequisite: course 210A (concurrently) or consent of instructor. 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.

211B. Applied Epidemiology II (1) II. The Staff (Meyer in charge)
 Laboratory—3 hours. Prerequisite: courses 210A and 211A. Emphasis is on decision making with respect to the type and amount of data required for solving an epidemiological problem, and the selection of appropriate statistical, computer, or other methods for processing, analyzing, and interpreting this data.

211C. Applied Epidemiology III (5) III. The Staff (Meyer in charge)
 Laboratory—15 hours. Prerequisite: courses 210B and 211B. Completion of the exercise begun in course 211B, including consideration of alternative approaches to the presentation of data and conclusions and formulation of recommendations for further investigations.

211D. Applied Epidemiology IV (6) I. The Staff (Meyer in charge)
 Laboratory—18 hours. Prerequisite: course 211C. Completion of the exercise continued from 211C, including consideration of alternative approaches to the presentation of data and conclusions and formulation of recommendations for further investigations.

212. Epidemiology of the Zoonoses (3) II. Meyer
 Lecture—1 hour; discussion—2 hours. Prerequisite: course 210A or consent of instructor. Biological and ecological features of infections shared by man and other animals with particular attention to those perpetuated in nature by wildlife and those which are of greater public health and economic significance.

216. Mass Screening for Diseases in Populations (3) II. Yamamoto
 Lecture—2 hours; laboratory—3 hours. Prerequisite: course 210A or consent of instructor. Consideration of immunodiagnostic and other techniques for screening of hu-

man and animal populations for abnormalities and diseases; evaluation of their usefulness to study incidence and/or prevalence and for application in programs of prevention and control.

218. Disease Control and Eradication (4) III. Riemann
 Lecture—2 hours; laboratory—6 hours. Prerequisite: course 216 or consent of instructor. Studies of various approaches used to control diseases in animals, including man. Discussions will be concerned with past successes and failures and emphasis placed on future prospects and limitations of these methods.

220. Advanced Avian Medicine (3) II. The Staff (Adler in charge)
 Lecture—3 hours. Prerequisite: enrollment in Avian Medicine option of MPVM program, senior standing in school of Veterinary Medicine, or consent of instructor. Instruction on the methods of prevention of the major diseases of domestic poultry. (S/U grading only.)

225. Preventive Avian Medical Practice (3) III. McCapes
 Lecture—3 hours. Prerequisite: enrollment in avian medicine option of MPVM program, junior or senior 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.

240. Veterinary Medicine and Human Health (3) II. Schwabe
 Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: professional veterinary or graduate standing or consent of instructor. Fulfillment of veterinary medicine's historic and newer roles as a human health profession; emphases on zoonoses prevention, comparative medical research, monitoring environmental hazards, organized efforts to promote humane values and mental health.

242. Veterinary Medicine and the World Food Population Problem (3) II. Schwabe
 Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: professional veterinary or graduate standing or consent of instructor. Survey of the world food-population problem, emphasizing effects of animal diseases and their control upon production of foods of animal and plant origin; comparisons of important Third World and other situations; discussion of current and future prospects. Offered in odd-numbered years.

254. Public Health Aspects of Meat and Meat Products Technology (2) III. Riemann, Genigeorgis
 Lecture—2 hours. Prerequisite: consent of instructor. Study of the influence of techniques and procedures for processing meats and meat products upon their wholesomeness as food.

255. Animal Health Economics (3) III. Riemann
 Lecture—2 hours; discussion—1 hour. Prerequisite: courses 103C and 210C (may be taken concurrently). Evaluation of the economic aspects of herd health programs and control or eradication programs of diseases in animal populations.

256. Advanced Food Hygiene Laboratory (3) II. Genigeorgis
 Lecture—1 hour; laboratory—6 hours. Prerequisite: a DVM degree or the equivalent, or consent of instructor. Techniques used in a veterinary food hygiene laboratory to detect pathogens, adulterants, contaminants, and other substances and factors affecting wholesomeness of foods of animal origin.

290. Current Topics in Avian Medicine (1) III. Yamamoto
 Seminar—1 hour. Topics from the current literature in avian medicine will be assigned to students for discussion and interpretation. (S/U grading only.)

296. 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.)

Family Practice

See Medicine

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 such as those used in the production of microbial cells, drugs, enzymes, solvents, acids, and vitamins, in the expansion of the food supply, and in waste management and preservation of the environment, are further opportunities for study. Courses are selected in consultation with advisers. Graduates qualify for supervisory, technical, research, sales or executive positions in the food, beverage, and allied industries, in the fermentation industries, and in governmental agencies.

The major can provide preparation for graduate study in food science, microbiology, agricultural chemistry or biochemistry.

It may be necessary to limit enrollment in this major due to limitations placed on UCD resources.

Fermentation Science

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
Preparatory Subject Matter	68
Biochemistry (Biochemistry 101A, 101B)	6
Biology (Biological Sciences 1)	5
Chemistry (Chemistry 1A, 1B, 1C, 5, 8A, 8B)	25
Mathematics (Mathematics 16A 16B)	6
Statistics including analysis of variance (Agricultural Science and Management 150 or Statistics 102)	4
Microbiology (Bacteriology 2, 3)	4
Physics (Physics 2A-2B-2C plus one unit of laboratory, e.g., Physics 3A)	10
Written or oral expression (see College requirement)	8
Depth Subject Matter	40
Choose from: Viticulture and Enology 3, 123, 124, 125, 126, 140, 217, 219; Food Science and Technology 102, 102L, 104, 104L, 105, 106, 108, 110A, 110B, 111, 150, 150L, 235, 250, 251; Biochemistry 101L, 123, 123L; Bacteriology 105, 106, 130A-130B-130L, 150, 150L, 230, 250; Agricultural Engineering 245; Environmental Toxicology 138; Epidemiology and Preventive Medicine 150; Chemistry 107A, 107B, 130; Consumer Science 135.	

Restricted Electives	28
Selected according to student's educational goal and upon approval of adviser. (A related series of primarily upper division courses intended.)	
Breadth Subject Matter	24
Social sciences and humanities or others as approved by adviser.†	
Unrestricted Electives	20
Total Units for the Major	180

Major Adviser. R.E. Kunkee (*Viticulture and Enology*).

Graduate Study. See page 99 and the *Announcement of the Graduate Division*.

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 the constituents of foods and the changes which occur in the constituents before and during storage and on processing. 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. Through the appropriate choice of both electives and in-depth courses in food science and technology, the major offers broad education to students planning careers in food processing, food research, and other food-related fields.

The major also offers excellent preparation for graduate work in agricultural chemistry, biochemistry, nutrition, medicine, and the life sciences.

Food Biochemistry

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
Preparatory Subject Matter	77-83
Biochemistry (Biochemistry 101A, 101B)	6
Biology (Biological Sciences 1)	5
Chemistry, one year general and analytical chemistry (Chemistry 1A-1B-1C, 5 or 4A-4B-4C), one year organic chemistry including at least one laboratory course (Chemistry 128A-128B-128C-129A), and two quarters of physical chemistry (Chemistry 107A-107B or 110A-110B)	32-36
Mathematics, including one year of calculus (Mathematics 16A-16B-16C or 21A-21B-21C), and one course from Mathematics 29, 22A, 22B, 22C, Statistics 13	12
Microbiology (Bacteriology 2 and 3; Botany 2 or Zoology 2-2L may be substituted)	4-6
Physics, any course except Physics 10 and including at least one laboratory course (Physics 2A-2B-2C and 3A or 3B or 3C; or 8A-8B-8C)	10
English (see College requirement)	8
Depth Subject Matter	36
Food Science and Technology, including 103, 104, 104L, 110A or 111, 113, and 125	31

†Units earned in satisfaction of the American History and Institutions requirements may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Biochemistry 123, 123L	5
Breadth Subject Matter	22
Social sciences and humanities, including 4 units of rhetoric†	
22	
Restricted Electives	20
At least one upper division biochemistry, course, other than Biochemistry 101A, 101B, 101L, and one nutrition course of at least 3 units. The remaining units can be selected from biochemistry, physiology, environmental toxicology, public health, bacteriology, or other subjects related to Food Science.	
Unrestricted Electives	19-25
Total Units for the Major	180

Major Adviser. M. Mazelis (*Food Science and Technology*).

Graduate Study. See page 99.

Food Science

(College of Agricultural and Environmental Sciences)

The Major Program

Food Science applies physical, biological, engineering, and social sciences to processing, preservation, packaging, storage, evaluation and utilization of foods. Instruction emphasizes the principles of biology, chemistry, microbiology, and other sciences as they are applied to the conversion of raw materials into processed foods. General principles are stressed, not specific food commodities.

Students completing this major receive excellent training and experience for employment in the world's largest industry, the food industry. Opportunities for employment include positions in the food and allied industries where graduates can engage in processing, sensory evaluation, quality assurance, product development, research, and management functions; in education as teachers; and in research, extension, and administration. Local, state and federal governments offer opportunities for employment as research supervisors, in regulatory agencies, in policy and management positions. Graduate study for the Food Science student may lead to the M.S. degree in Food Science or the Ph.D. degree in related fields such as agricultural chemistry, biochemistry, microbiology and nutrition.

Food Science

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
Preparatory Subject Matter	62-67
Biology and microbiology (Biological Sciences 1, Bacteriology 2, 3)	9
Chemistry and biochemistry, including analytical chemistry (Chemistry 1A-1B-1C-5 or 4A-4B-4C, 8A-8B; Biochemistry 101A-101B)	27-31

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Mathematics and physics, including two courses in calculus (Agricultural Science and Management 150 or Statistics 13; Mathematics 16A-16B; Physics 2A-2B-2C)	18-19
Written or oral expression (see College requirement)	8
Depth Subject Matter	28
Upper division courses in Food Science and Technology, including 100A-100B, 103, 104, 104L, 110A-110B, 190	28
Breadth Subject Matter	28
Social sciences and humanities electives†	28
Restricted Electives	32-37
Nutrition 112 and other courses selected in accordance with student's educational goal and upon approval of adviser.	
Unrestricted Electives	25
Total Units for the Major	180

Major Adviser. E. B. Collins (*Food Science and Technology*).

Graduate Study. A program of study and research leading to the M.S. degree in Food Science is available. For further information on graduate study see page 99 and the *Announcement of the Graduate Division*.

Graduate Advisers. See *Class Schedule and Room Directory*.

Food Science and Technology

(College of Agricultural and Environmental Sciences)

Bernard S. Schweigert, Ph.D., Chairperson of the Department

Department Office, 126 Cruess Hall (752-1465)

Faculty

Ericka L. Barrett, Ph.D., Assistant Professor
 Richard A. Bernhard, Ph.D., Professor
 A. Wade Brant, Ph.D., Lecturer
 W. Duane Brown, Ph.D., Professor
 John Bruhn, Ph.D., Lecturer
 Paul A. Carroad, Ph.D., Assistant Professor
 (*Food Science and Technology, Agricultural Engineering*)
 Edwin B. Collins, Ph.D., Professor
 Walter L. Dunkley, Ph.D., Professor
 Robert E. Feeney, Ph.D., Professor
 Dieter W. Gruenwedel, Ph.D., Professor
 Jerald M. Henderson, D.Eng., Professor
 (*Food Science and Technology, Mechanical Engineering*)
 Eugene L. Jack, Ph.D., Professor Emeritus
 Walter G. Jennings, Ph.D., Professor
 Sherman J. Leonard, B.S., Lecturer
 Michael J. Lewis, Ph.D., Professor
 Bor S. Luh, Ph.D., Lecturer
 George L. Marsh, M.S., Professor Emeritus
 Mendel Mazelis, Ph.D., Professor
 R. Larry Merson, Ph.D., Professor (*Food Science and Technology, Agricultural Engineering*)
 Martin W. Miller, Ph.D., Professor
 Emil M. Mrak, Ph.D., Professor Emeritus
 David M. Ogrzydziak, Ph.D., Assistant Professor
 Michael A. O'Mahony, Ph.D., Assistant Professor
 Rose Marie Pangborn, M.S., Professor
 Herman J. Phaff, Ph.D., Professor
 Robert J. Price, Ph.D., Lecturer

NOTE: For key to footnote symbols, see page 130.

Gerald F. Russell, Ph.D., Associate Professor
 Barbara O. Schneeman, Ph.D., Assistant Professor
 (*Food Science and Technology, Nutrition*)

Bernard S. Schweigert, Ph.D., Professor
 C.F. Shoemaker, Ph.D., Assistant Professor
 R. Paul Singh, Ph.D., Assistant Professor (*Food Science and Technology, Agricultural Engineering*)

J.M. Smith, Sc.D., Professor (*Food Science and Technology, Chemical Engineering*)

Lloyd M. Smith, Ph.D., Professor
 Clarence Sterling, Ph.D., Professor
 George F. Stewart, Ph.D., Professor Emeritus
 Aloys L. Tappel, Ph.D., Professor
 Nikita P. Tarassuk, Ph.D., Professor Emeritus
 Reese H. Vaughn, Ph.D., Professor Emeritus
 John R. Whitaker, Ph.D., Professor

Major Program and Graduate Study. See the major in Food Science and page 99 for graduate study.

Related Courses. See courses in Biochemistry and Biophysics, Consumer Science, Nutrition, and Viticulture and Enology; Environmental Toxicology 101, Epidemiology and Preventive Medicine 150, Plant Science 112, and 112L.

Courses in Food Science and Technology

Lower Division Courses

1. Introduction to Food Science (3) I, II. Jennings, Schweigert

Lecture—2 hours; discussion—1 hour. Development and maintenance of an adequate food quality and its measurement; scientific and technological aspects of converting raw material and plant products into a large variety of processed and preserved foods; maintenance and improvement of the acceptability and nutritional value of foods. Course not open for credit to students who have completed courses 100A, 100B, or 111.

20. Food and Culture: An Introduction to Culture, Diet, and Cuisine (4) III. Grivetti (Nutrition, Geography)

Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 2, Geography 2 and Nutrition 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. (Same course as Nutrition 20.)

49. Processing Plant Studies (1) I, Leonard

Prerequisite: course 1. Field trips to observe processing, distribution, quality control and regulatory control of foods and related materials.

93. Public Issues in Nutrition and Food Science (1) II. Weir (Nutrition), Schweigert

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 (Schweigert in charge) (P/NP grading only.)

Upper Division Courses

100A. Principles of Food Composition and Properties (3) I, Russell

Lecture—3 hours. Prerequisite: Chemistry 8A and 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. Mazelis

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.

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.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 100B (may be taken concurrently). Course designed to give laboratory experience with food systems and properties described in course 100B.

102. Malting and Brewing Technology (3) I, Lewis

Lecture—3 hours; field trips and pilot-scale brewing by arrangement. Prerequisite: preparation in biochemistry, microbiology and chemistry advised. Technology of the malting, brewing and fermentation processes is integrated with the chemistry, biochemistry, and microbiology that determines industrial practices and products quality.

102L. Malting and Brewing Science Laboratory (3) II, Lewis

Discussion—1 hour; laboratory—6 hours. Prerequisite: courses 102, 103, Chemistry 5. Laboratory experience in the use and application of standard brewing methods of analysis. Data collection on raw materials and application of these data in pilot-scale malting and brewing exercises. Processing studies and influence of process variables on product attributes.

103. Physical and Chemical Methods for Food Analysis (5) I, Whitaker, Bernhard

Lecture—3 hours; laboratory—6 hours. Prerequisite: Chemistry 5 and 8B; Biochemistry 101B (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, Collins

Lecture—3 hours. Prerequisite: Bacteriology 2; Chemistry 8A; or equivalent courses. Taxonomy, physiology, ecology, and control of beneficial microorganisms important in the manufacture and ripening of foods, undesirable microorganisms that produce defects and spoil foods, and harmful microorganisms associated with food-borne infections and intoxications.

104L. Food Microbiology Laboratory (2) II, Barrett, Collins, Ogrzydziak

Laboratory—6 hours. Prerequisite: Bacteriology 3 or the equivalent; course 104 (should be taken concurrently). Laboratory exercises illustrate selected subject matter discussed in course 104. Cultural and morphological characteristics of bacteria involved in food spoilage and in food-borne disease. Analysis of microbiological quality of foods.

105. Food Microbiology Laboratory. (3) III, Barrett, Collins, Ogrzydziak

Discussion—1 hour; laboratory—5 hours. Prerequisite: courses 104, 104L. Cultural and morphological characteristics of bacteria and fungi involved in food fermentations and food production. Laboratory methods in the use of microbes for food production.

106. Industrial Fermentations (3) I, Carroad, Ogrzydziak, Phaff

Lecture—3 hours. Prerequisite: Biochemistry 101A-101B and Bacteriology 2 or the equivalent; familiarity with engineering (courses 110A, 110B) recommended. Microbiological, biochemical and engineering fundamentals of industrial fermentations.

***106L. Food and Industrial Microbiology Laboratory** (3) Extra-session summer. Lewis

Laboratory—90 hours total. Prerequisite: a course in industrial fermentation (e.g., course 106). Microorganisms and their activities in relation to industrial processes such as baking; brewing; production of industrial alcohol, yeasts, solvents, vitamins, enzymes, antibiotics, and other drugs. Offered in odd-numbered years.

107. Principles of Sensory Evaluation of Foods (3) II, Pangborn

Lecture—3 hours. Prerequisite: Agricultural Science and Management 150. Nature of sensory responses with emphasis on aroma, taste, and texture of foods; critical use of analytical laboratory methods; relation of sensory with chemical and instrumental measurement; statistical analysis and interpretation of sensory data.

107L. Principles of Sensory Evaluation of Foods Laboratory (2) II, Pangborn

Discussion—1 hour; laboratory—3 hours. Prerequisite: Agricultural Science and Management 150; course 107 (must be taken concurrently). Laboratory demonstrations and student participation in the preparation and administration of experimental food samples, collection and statistical analysis of data, and interpretation of results from sensory tests.

108. Food Processing Plant Sanitation (3) II. Lewis
Lecture—3 hours. Prerequisite: Chemistry 8B and Bacteriology 2. 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.

110A. Physical Principles in Food Processing (3) I, Merson
Lecture—2 hours; laboratory—2 hours. Prerequisite: Physics 2A and 2B 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—2 hours; laboratory—2 hours. Prerequisite: course 110A or the equivalent. Rate processes; conduction, convection, and radiation heat transfer; refrigeration principles; psychrometrics; mass diffusion and interphase mass transfer.

111. Introduction to Food Processing (4) I, Miller
Lecture—3 hours; discussion-demonstration—2 hours. Prerequisite: Bacteriology 2, Chemistry 8A-8B, and Physics 2A-2B, or the equivalent. Food processing from farm to package. Characteristics of raw materials, fresh produce handling, overview of food processing and processing unit operations, chemical additives. Demonstration and field trips.

113. Structure of Food Materials (3) III. Sterling
Lecture—3 hours. Anatomical features and structural properties of foods; histochemical tests of food tissues; rheological characteristics; food texture.

117. The Senses and Sensory Measurement (4) I, O'Mahony
Lecture—4 hours. Prerequisite: Biological Sciences 1, Statistics 13 or Agricultural Science and Management 150 (may be taken concurrently). Structure and function of sensory receptor systems; psychological and physiological variables affecting sensory responses. Critical examination of modern psychophysics and problems of sensory measurement and their relation to food flavor.

119AT. Principles of Dairy Processing (4) III. Dunkley
Personalized system of instruction. Prerequisite: Bacteriology 2; Chemistry 8B. Technical principles related to the commercial processing of milk from the farm to the consumer; includes fluid, concentrated, dried and frozen products, butter, and cheese; theory and practical applications.

120. Muscle as Food (2) III.
Lecture—2 hours; demonstrations (occasional). Prerequisite: Biochemistry 101B and Bacteriology 2 or the equivalent. Biochemical, physiological, microbiological, psychophysical and engineering principles underlying the conversion of muscle to meat, man's most expensive food. Includes processing, preservation, brining, smoking and curing of meat, poultry, and sausages.

121. Birds and their Eggs as Food (3) I, _____, Brant
Lecture—3 hours; demonstrations. Prerequisite: consent of instructor; Biochemistry 101B recommended. Avian products as food considered from the physical, chemical and nutritional aspects. Factors affecting processing, preservation and quality.

122. Marine Food Science (3) II. Brown, Ogrzydzak
Lecture—3 hours. Prerequisite: Bacteriology 2; Biochemistry 101B (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.

125. Metals and Metal Complexes in Foods (3) II. Gruenwedel
Lecture—3 hours. Prerequisite: Biochemistry 101B; Chemistry 107B or the equivalent. Structure, reactions, and physical properties of metal complexes, particularly those of importance to food science. The biochemistry of metal ions in foods.

130. Chemistry of Milk and Dairy Products (3) II. L. Smith
Lecture—3 hours. Prerequisite: Biochemistry 101A. The chemistry of milk constituents; physical and chemical properties of milk; and the changes that occur during the processing and storage of dairy products, with emphasis on quality.

131. Packaging Processed Foods (3) III. Henderson
Lecture—3 hours. Prerequisite: course 1 or 111, Chemistry 8B, Bacteriology 2 and Physics 2B, or consent of instructor. Technical aspects of packaging processed foods. Definitions and functions of packages for food. Packaging materi-

als and properties. Public health problems associated with packaging. Food-packaging interactions for major commodities and their control.

150. Thermal Processing of Foods (3) III. Merson, Leonard
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. Leonard, Carroad
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.

190. Senior Seminar (1) I, Schweigert, Carroad
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 (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work experience on or off campus in the practical application of food science. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Schweigert in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Schweigert in charge)
(P/NP grading only.)

Graduate Courses

201. Biochemistry and Food Science (3) I, Tappel
Lecture—3 hours. Prerequisite: Biochemistry 101B. Topics on enzymes, proteins, pigments, lipids and vitamins. Biochemical principles and methods related to food composition, preservation and processing. Includes research proposals and group problem solving.

207. Advanced Sensory-Instrumental Analyses (3) III. Noble (Viticulture and Enology), Pangborn
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 107L 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.

210. Proteins: Functional Activities and Interactions (3) II. Feeney
Lecture—3 hours. Prerequisite: Biochemistry 101B. 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. Chemistry of the Food Lipids (3) III. L. Smith
Lecture—3 hours. Prerequisite: Biochemistry 101A. Chemical constitution, molecular structure, and stereo chemistry of the fats, phospholipids, and related compounds. Methods of isolation, characterization, and synthesis. Relation of molecular structure to physical properties.

213. Macromolecular Gels (2) III. Sterling
Lecture—2 hours. Prerequisite: Biochemistry 101A. Structural interrelationship of water with typical biological polymers in gels; aerogels and xerogels; gel properties and methods of study. Offered in odd-numbered years.

235. Mycology of Food and Food Products (3) III. Miller
Lecture—3 hours. Prerequisite: course 104 and 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. Isolation and Characterization of Trace Volatiles (3) I, Jennings
Lecture—3 hours. Prerequisite: at least one introductory course in inorganic chemistry, organic chemistry, physics. Gas chromatographic theory; preparation, evaluation and use of columns; sample preparations and recovery, qualitative and quantitative analysis; ultraviolet, infrared and mass spectrometry.

251. Isolation and Characterization of Trace Volatiles (2) I, Jennings
Discussion—1 hour; laboratory—3 hours. Prerequisite: course 250 (must be taken concurrently). Laboratory demonstrations and discussions of methods for optimizing gas chromatographic performance, treatment of retention data, preparation and evaluation of packed, SCOT and open tubular glass capillary columns, sample preparation and trapping, microreaction coupled with gas chromatography infrared and mass spectrometry.

290. Seminar (1) I, II, III. The Staff (Schweigert in charge)
Seminar—1 hour. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Schweigert in charge)
Directed study on food chemistry, food microbiology, food processing, or sensory evaluation.

299. Research (1-12) I, II, III. The Staff (Schweigert 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 has been incorporated as an option within the major in Dietetics (page 170). If you are interested in preparing for a career in commercial organizations such as hotels, restaurants, industrial cafeterias, and contract food services, as well as in public and private institutions such as hospitals, correctional institutions, schools, and colleges, consult the Department of Nutrition regarding the Management specialization listed under the Unrestricted Electives of the Dietetics major.

Related Courses. See Food Science and Technology, and Nutrition.

Courses in Food Service Management

Questions pertaining to the following courses should be directed to the instructor or to the Nutrition Department Office, 129 Everson Hall.

Upper Division Courses

120. Principles of Quantity Food Production (3) III. Prophet
Lecture—3 hours. Prerequisite: Food Science and Technology 100B and 101B. 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. Quantity Food Purchasing and Sanitation (3) I, Schneeman
Lecture—3 hours. Prerequisite: Bacteriology 2; 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 (Weir in charge)
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 (Weir in charge)
Lecture—3-36 hours. Prerequisite: one upper division 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 (Weir 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 (Weir in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Weir in charge)

tic discipline and to enrich themselves through the study of a foreign culture, thus enabling themselves to play a more enlightened role in the international picture. It is an excellent preparation for professional schools.

The UCD facilities and activities supporting these programs are manifold; up-to-date language laboratory, French Club, Pi Delta Phi National French Honorary Society, department reading room, and a superb research library to name a few. There are, of course, close ties to several French campuses, thanks to the Universitywide Education Abroad Program.

The Major and Minor Programs

Two tracks of study are available to prospective majors and minors, one emphasizing the language, the other the literature. Both train the students in all four of the language skills (reading, writing, speaking, and understanding). *Plan A* is usually followed by students interested in teaching, a career in the arts, general cultural positions, or graduate studies in French. *Plan B* is generally selected by those interested in teaching, international business, or government work.

Five upper division literature courses chosen in consultation with undergraduate adviser, from at least three of the following six areas 20

- Middle Ages
- 16th Century
- 17th Century
- 18th Century
- 19th Century
- 20th Century

UNITS

French (Language and Civilization emphasis) 24

French 104 or 105, 107A, 107B, 110 or 138 16

Two additional courses chosen in consultation with undergraduate adviser, in French language or literature, or in French culture offered outside the department 8

Prerequisite Credit. Credit will not normally be given for a course if it is prerequisite to a course already successfully completed. Exceptions can only be made by the Department Chairperson.

Graduate Study. The Department offers programs of study and research leading to the M.A. and Ph.D. degrees in French.

The Master of Arts degree is available to students who have an undergraduate major in French or its equivalent. Students, in special circumstances, may make up work deficient to the major requirements and then continue with an advanced degree. Candidates will be recommended for admission to graduate studies in French provided the requirements of the Graduate Division and the Department of French and Italian have been met. Basic requirements are: a minimum residence of three quarters, 36 quarter units, and a passing score in the comprehensive examination.

The doctoral program stresses individualized study suited to the student's interest. Particularly encouraged are programs that involve the use of resources in allied departments and programs such as Dramatic Art, Comparative Literature, English, etc. The Department regularly sponsors an exchange program with French institutions of learning. Basic requirements include demonstration of linguistic competence, passing of preliminary and qualifying examination, completion of an acceptable dissertation, and one year of teaching in the department as a Teaching Assistant.

Graduate Advisers. R.B. York (M.A. degree); M.E. Blanchard (Ph.D. degree).

Teaching Credential Subject Representative. R.B. York. See page 105 for Teacher Education Program.

Foreign Literature in Translation

See Literature in Translation

French

(College of Letters and Science)

Claude Abraham, Ph.D., Chairperson of the Department

Department Office (French and Italian), 513 Sproul Hall

Faculty

- Claude Abraham, Ph.D., Professor
- ³Max Bach, Ph.D., Professor
- Marc Eli Blanchard, Agrégé de Lettres, Professor
- ²Edward M. Bloomberg, Ph.D., Associate Professor
- Richard N. Coe, Ph.D., F.A.H.A., Professor
- Ruby Cohn, Ph.D., Professor (*Comparative Literature, Dramatic Art*)
- Gerald Herman, Ph.D., Associate Professor
- Margo R. Kaufman, M.A., Lecturer
- ⁴Manfred Kusch, Ph.D., Associate Professor
- ³Marshall Lindsay, Ph.D., Professor
- Maria Manoliu-Manea, Ph.D., Professor
- Ruth B. York, Ph.D., Lecturer

The Program of Study

The Program offers courses in language, culture, and literature (the latter in French and in translation) most of which may be taken to satisfy the Humanities Area Requirement.

Although a major or minor in French is excellent preparation for prospective teachers or for those contemplating careers in government or business; it has broader applications and is designed for those wishing to obtain solid training in a humanistic

French

A.B. Major Requirements:

UNITS

Preparatory Subject Matter (Plan A and Plan B) **16-39**

French 1, 2, 3, 4 (or the equivalent) 0-23

French 6, 30A, 30B, 45 16

Plan A: Literature Emphasis

Depth Subject Matter 40

French 104 or 105; 110 8

One course from French 130, 131, 132 4

One course from each of three of the following five literary periods 12

- a. Medieval: French 115A, 115B
- b. 16th Century: French 116A, 116B
- c. 17th Century: French 117A, 117B, 117C
- d. 18th Century: French 118A, 118B, 118C
- e. 19th Century: French 119A, 119B, 119C, 119D

One course in 20th-century literature from French 120A, 120B, 121, 122, 123 4

Additional upper division units in French language or literature 8

One additional upper division course in a national literature other than French, or in Comparative Literature 4

Total Units for the Major (Plan A) **56-79**

Plan B: Language Emphasis

Depth Subject Matter 39

French 104, 105, 107A, 107B, 110, 138, 159, 160 31

One literature course from French 117A, 118A, 119A, 119B, 120B, 121, 122, 140 4

One additional upper division French literature course 4

Total Units for the Major (Plan B) **55-78**

Recommended

French 108A, 108B; French 107A, 107B and 160 for students interested in obtaining a "single subject" teaching credential in California.

Major Adviser. M. Kusch.

A.B. Minor Program Requirements:

The minor in French may be pursued with emphasis on either literature or language and civilization.

UNITS

French (Literature emphasis) 24

French 45 4

Courses in French

Lower Division Courses

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 4.

1. Elementary French (6) I, II, III. The Staff
Discussion—5 hours; laboratory—two ½-hour sessions. 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) Extra-session summer. 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 (6) I, II, III. The Staff
Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 1 or the equivalent. Continuation of course 1.

NOTE: For key to footnote symbols, see page 130.

French

3. Intermediate French (6) I, II, III. The Staff
Discussion—5 hours; laboratory—1 hour. Prerequisite:
course 2. Continuation of course 2.

4. Intermediate French (5) I, II, III. The Staff
Discussion—5 hours. Prerequisite: course 3.

6. Problems in Language and Style (4) I, II, III. The Staff
Discussion—3 hours. Prerequisite: course 4 or the equivalent.
Reading of selected literary texts with emphasis on
problems of syntax, style, and vocabulary development.
Class discussion and composition.

8A. French Conversation (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: course 3. Practice in
speaking French. May be repeated once for credit. (P/NP
grading only.)

8B. French Conversation (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: course 4. Practice in
speaking French. May be repeated once for credit. (P/NP
grading only.)

25. French Literature in Translation (3) I, II, III. The Staff
(Chairperson in charge)

Lecture—1 hour; discussion—2 hours. Course is intended
to acquaint the non-major with representative examples of
French literature. Selected topics will include major authors,
genres, literary periods, movements, or special themes.

30A. Advanced Grammar (4) I, II, III. The Staff
Lecture-discussion—3 hours; written papers and reports.
Prerequisite: course 6. Grammar review, composition, and
the reading and discussion of literary texts.

30B. Advanced Grammar (4) I, II, III. The Staff
Lecture-discussion—3 hours; written papers and reports.
Prerequisite: course 30A or placement by examination.
Continuation of course 30A.

35. Explication and Dissertation (2) III. The Staff (Chairper-
son in charge)

Lecture—1 hour; discussion—1 hour. Prerequisite: course
6. Theory and practice of French *explication de texte* and
dissertation. Especially recommended for those students
planning to study abroad in French universities.

45. Introduction to French Literature (4) I, III. The Staff
Lecture-discussion—3 hours; short papers. Prerequisite:
course 6 or the equivalent. Selected themes in French litera-
ture.

98. Directed Group Study (1-5) I, II, III. The Staff
Primarily intended for lower-division students. Special
Study. (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. Translation and Composition (4) I. The Staff
Lecture-discussion—3 hours; essays. Prerequisite: course
30B or the equivalent. Practice in translation into French
using a variety of texts illustrating different problems and
styles; practice in French composition.

105. Advanced Translation and Composition (4) II. The Staff
Lecture-discussion—3 hours; essays. Prerequisite: course
30B or the equivalent. Development of skills and practice in
the techniques of writing French.

107A. Survey of French Culture and Institutions (4) I. The
Staff
Lecture—4 hours; term paper or oral presentation. Prere-
quisite: course 6. Introduction to aspects of French culture
such as art, architecture, music, literature. Provides a back-
ground in history, sociology and institutions from the origins
of 1715.

107B. Survey of French Culture and Institutions (4) II. The
Staff
Lecture-discussion—4 hours; term paper or oral presenta-
tion. Prerequisite: course 6. Introduction to aspects of
French culture such as art, architecture, music, literature.
Provides a background in history, sociology, and institu-
tions from 1715 to the present.

108A. Advanced French Conversation (2) I, II. The Staff
(Chairperson in charge)
Discussion—3 hours. Prerequisite: course 30A. Intensive
conversational practice stressing accurate pronunciation
and spoken language fluency. Not open to native speakers.
May not be counted toward the French major. May be
repeated once for credit. (P/NP grading only.)

108B. Advanced French Conversation (2) II, III. The Staff
(Chairperson in charge)
Discussion—3 hours. Prerequisite: course 30B. Intensive
conversational practice stressing accurate pronunciation
and spoken language fluency. Not open to native speakers.
May not be counted toward the French major. May be
repeated once for credit. (P/NP grading only.)

110. Advanced Problems in Language and Style (4) III. The
Staff
Lecture-discussion—3 hours; essays. Prerequisite: course
104 or 105. Analysis of style and practice in composition.

115A. Medieval Literature: Epic and Romance (4) I. Herman
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. *La Chanson de Roland*, *Tristan et
Iseut*, and selected works of Chrétien de Troyes. Texts to be
read in modern French.

***115B. Medieval Literature: Satiric and Didactic Poetry** (4) III.
Herman
Lecture-discussion—3 hours; term paper. Prerequisite:
course 45 or consent of instructor. Study of the didactic, and
satiric or popular literature of the twelfth and thirteenth cen-
turies. Readings will include some of the *fabliaux*, *Aucassin
et Nicolette*, and selections from the *Roman de Renart* and
Roman de la Rose.

***116A. Literature of the Sixteenth Century** (4) III. Lindsay
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Study of the lyric poetry of the six-
teenth century from Marot to d'Aubigné, with emphasis on
the Pléiade.

116B. Literature of the Sixteenth Century (4) III. Blanchard
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Rabelais and Montaigne. Critical
study of the works in relationship to the period.

***117A. Theater of the Seventeenth Century** (4) II. Abraham
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Study of plays of Racine, Molière and
Corneille.

***117B. Moralists of the Seventeenth Century** (4) II. Bloom-
berg
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Study of works of Pascal, La Roche-
foucauld, etc.

117C. Poetry and the Novel in the Seventeenth Century (4) II.
Abraham
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Study of representative poets and
novelists: La Fayette, Malherbe, La Fontaine, etc.

***118A. "Les Philosophes"** (4) III. Kusch
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Readings from Montesquieu, Voltaire,
Diderot, Rousseau and the Encyclopédie.

118B. The Novel in the Eighteenth Century (4) I, Kusch
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Novels of Lesage, Prévost, Diderot,
Rousseau, Laclos, Sade.

***118C. The Theater in the Eighteenth Century** (4) III. Cohn
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Plays of Marivaux and Beaumarchais.

***119A. The Nineteenth Century** (4) II. Coe
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Romanticism in the drama and novel.

119B. The Nineteenth Century (4) II. Coe
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Realism and naturalism: Balzac,
Flaubert, Maupassant, Zola.

***119C. The Nineteenth Century** (4) II. Lindsay
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Poetry from the Pre-Romantics to
Baudelaire.

119D. The Nineteenth Century (4) I, Lindsay
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Symbolism: the poetry and poetics of
Baudelaire, Mallarmé, Verlaine, Rimbaud, Corbière, Lafor-
gue, and Lautréamont.

120A. Twentieth-Century Drama (4) I, York
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Representative plays from Jarry to
Giraudoux.

***120B. Twentieth-Century Drama** (4) II. York
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Representative plays from Anouilh to
Ionesco.

***121. Twentieth-Century Novel** (4) I, Lindsay
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Gide and Proust.

122. Twentieth-Century Novel (4) III. Lindsay
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. From Malraux to the Nouveau Roman.

***123. Twentieth-Century Poetry** (4) III. Lindsay
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Selected poetic texts from Apollinaire
to the present.

***130. Critical Reading of Poetry** (4) I, Lindsay
Lecture—3 hours. Prerequisite: course 45 or consent of
instructor. Analysis and evaluation of works representing
main types of French poetry. Study of poetic conventions
and versification.

***131. Critical Reading of Fiction** (4) I, Lindsay
Lecture—3 hours. Prerequisite: course 45 or consent of
instructor. Analysis and evaluation of short stories and
novels representing the main types of French fiction, with
emphasis on narrative structure and techniques.

132. Critical Reading of Drama (4) III. Cohn
Lecture—3 hours. Prerequisite: course 45 or consent of
instructor. Analysis and evaluation of plays representing
main types of French drama, with emphasis on dramatic
structure and techniques.

138. Advanced Literary Translation (4) III. Bloomberg
Lecture-discussion—3 hours; term paper. Prerequisite:
either course 104 or 105. Morphological, syntactical, and
stylistic aspects of English-French translation.

***140. Study of a Major Writer** (4) III. York
Lecture—3 hours; term paper. Prerequisite: course 45 or
consent of instructor. Concentrated study of a single
oeuvre. May be repeated for credit with consent of instruc-
tor.

***150. Masterpieces of French Literature** (4) I, Lindsay
Lecture-discussion—3 hours; term paper. Prerequisite: En-
glish 1. Reading, lectures, and discussion in English. May
not be counted as part of the major in French. Offered in
even-numbered years.

159. French Phonetics (3) II. Manea
Lecture-discussion—3 hours; laboratory—1 hour. Prerequi-
site: course 6 or the equivalent. Contrastive analysis of the
sounds of English and French; practical exercises in the
pronunciation of modern French, with special emphasis on
the problems of English-speaking students.

160. Structure of the French Language (4) III. Manea
Lecture-discussion—3 hours; term paper. Prerequisite:
course 6 or consent of instructor; course 159 recom-
mended. Linguistic analysis of modern French.

***161. Evolution of Standard French** (4) I, Manea
Lecture-discussion—3 hours; term paper. Prerequisite:
course 6 or consent of instructor. The development of stan-
dard French from its origins to the present, tracing changes
in pronunciation, orthography, and grammar and examin-
ing the role of French in the world.

197T. Tutoring in French (2-4) I, II, III. Kaufman
Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite:
upper division standing and consent of Chairperson. Tutor-
ing 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. The Staff
Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite:
upper division standing and consent of Chairperson. Tutor-
ing 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

200A. "Analyse Littéraire" (4) I, Lindsay
Seminar—3 hours; term paper. Prerequisite: graduate
standing. Introduction to the methodology and practice of
literary criticism. Textual reading and group study of one
selected work.

200B. "Analyse Littéraire" (4) II. Blanchard
Seminar—3 hours; term paper. Prerequisite: graduate
standing. Further introduction to methodology. Theory of
literature and philosophy of criticism, writing and reading, in
the context of today's controversy. Study of selected critical
approaches against specific texts.

201A. History of the French Language (4) II. Manea
Seminar—3 hours. Examination of earliest documents trac-
ing the development of the language from Latin to Old
French; examination of Old French texts. Latin useful, but
not essential.

201B. History of the French Language (4) III. Manea
Seminar—3 hours. Evolution of Modern French from the
Renaissance to the present, with emphasis on the relation-
ship between language and literature and the influence of
grammarians.

202A. Medieval French Literature: The Epic Tradition (4) III. Herman
Seminar—3 hours. Prerequisite: course 201A recommended. Literary and stylistic study of selected *chansons de geste*. Readings in Old French. May be repeated for credit with consent of instructor when different topic studied.

***202B. Medieval French Literature: The Romance Tradition** (4) III. Herman
Seminar—3 hours. Prerequisite: course 201A recommended. Chrétien de Troyes and the doctrine of courtly love. Literary and stylistic study of Chrétien's major works. Readings in Old French. May be repeated for credit with consent of instructor when different topic is studied.

***205A. Sixteenth-Century Literature: The Humanists** (4) III. Blanchard
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.

***205B. Sixteenth-Century Literature: Pre-Renaissance and Renaissance Poets** (4) I, Lindsay
Seminar—3 hours. The poetry of the *Ecole Lyonnaise* and of the *Pléiade*. May be repeated for credit when different topic is studied.

***206A. Seventeenth-Century Literature: Theater** (4) I, Abraham
Seminar—3 hours. The 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) III. Blanchard
Seminar—3 hours; term paper and/or exposé. The 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) III. The Staff
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. Kusch
Seminar—3 hours. Rise of the novel. A 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) II. Blanchard
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: Theater** (4) II. The Staff
Seminar—3 hours. Study of the works of one or more dramatists of the period. May be repeated for credit with consent of instructor when different topics are studied.

208C. Nineteenth-Century Literature: Poetry (4) II. Lindsay
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) III. 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) I, Cohn
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) II. 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) III. The Staff
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

***211. Studies in Criticism** (4) III. The Staff
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

212. Studies in the Theater (4) I, Coe
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

***213. Studies in Poetry** (4) III. 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. Bloomberg
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

238. Problems in French Composition and Syntax (4) III. Bloomberg
Seminar—3 hours. Prerequisite: graduate standing. Problems and techniques of English-French translation: morphological, syntactical, and stylistic.

297. Individual Research (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 (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 of a Modern Foreign Language (3) III. Kaufman
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 (1) I, Kaufman
Lecture—1 hour; discussion—1 hour. 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 (1) II. Kaufman
Lecture—1 hour; discussion—1 hour. 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.)

Genetics

(College of Agricultural and Environmental Sciences)

S. Richard Snow, Ph.D., Chairperson of the Department

Department Office, 357 Briggs Hall (752-0200)

Faculty

Robert W. Allard, Ph.D., Professor (*Genetics, Agronomy and Range Science*)

Francisco J. Ayala, Ph.D., Professor

James B. Boyd, Ph.D., Professor

Gordon J. Edlin, Ph.D., Professor

John H. Gillespie, Ph.D., Professor (*Genetics, Environmental Studies*)

Leslie D. Gottlieb, Ph.D., Professor

Melvin M. Green, Ph.D., Professor

Paul E. Hansche, Ph.D., Professor (*Genetics, Pomology*)

John A. Kiger, Jr., Ph.D., Associate Professor

Timothy Prout, Ph.D., Professor (*Genetics, Entomology*)

Raymond L. Rodriguez, Ph.D., Assistant Professor

S. Richard Snow, Ph.D., Professor

G. Ledyard Stebbins, Ph.D., Professor Emeritus

Michael A. Turelli, Ph.D., Assistant Professor

The Major Program

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 in improving domestic plants and animals.

Choice of College. Students may elect this major either in the College of Agricultural and Environmental Sciences or in the College of Letters and Science.

Students majoring in Genetics in the College of Letters and Science may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis. Further information can be obtained from the Division of Biological Sciences office, 150 Mrak Hall.

Genetics

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
Preparatory Subject Matter	57-68
Biological sciences (Biological Sciences 1)	5
Two of the following courses or course sequences: Bacteriology 2 and 3 or 3 and 102; Botany 2, Zoology 2-2L	9-12
Chemistry (Chemistry 1A-1B-1C or 4A-4B-4C; 8A-8B or 128A-128B-128C-129A)	21-26
Physics (Physics 2A-2B-2C)	9
Mathematics (Statistics 13; Mathematics 16A-16B-16C or 21A-21B-21C)	13-16

Depth Subject Matter	20-25
Biochemistry 101A-101B	6
Genetics 100A-100B-100L or 120-100L; or with adviser's consent, 115-100L	5-7
Three additional courses in genetics	9-12

Breadth Subject Matter

College of Agricultural and Environmental Sciences students:

English and/or rhetoric (see College requirement)	8
Social sciences and/or humanities†	28
Additional requirements as described on page 70.	

College of Letters and Science students:

Refer to page 93 for a description of requirements to be completed in addition to the major.

Restricted Electives

Six upper division courses in biological sciences or other fields relevant to genetics and related to student's interest, chosen with approval of adviser. 18-30

Unrestricted Electives

Total Units for the Major 180

Major Adviser. G.J. Edlin.

Graduate Study. The Graduate Group in Genetics offers study and research leading to the M.S. and Ph.D. degrees in Genetics. For detailed information contact the Chairperson of the Graduate Group (see page 216) and the *Announcement of the Graduate Division*.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

NOTE: For key to footnote symbols, see page 130.

Genetics; Genetics (A Graduate Group)

Graduate Advisers. Contact Genetics Graduate Group Office, 357 Briggs Hall.

Applied Genetics. See under Animal Genetics (page 141).

Related Courses. See Agronomy 221, 222, 223, 224, 225; Animal Genetics 107, 108, 109, 207; Anthropology 151, 152, 157; Bacteriology 130A-130B-130L, 260, 280; Biochemistry and Biophysics 204; Genetics Graduate Group; Physiological Sciences 255; Plant Pathology 215; Plant Science 103, 113, 122; Psychology 151, 251; Vegetable Crops 220; Zoology 148, 149, 158.

Courses in Genetics

Lower Division Courses

10. Heredity and Evolution for the People (4) I, Edlin; II, Gottlieb

Lecture—3 hours; discussion—1 hour. Course intended for liberal arts students. Examines principles and recent developments in genetics and evolution in context of their social implications.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Individual study for undergraduates. (P/NP grading only.)

Upper Division Courses

Courses 100A and 100B form a two-quarter, 6-unit sequence of introductory genetics in contrast to the one-quarter, 4-unit course 120. The level of the courses is the same.

100A. Principles of Genetics (3) I, Boyd

Lecture—3 hours; or autotutorial—2 hours and general assembly—1 hour. Prerequisite: Biological Sciences 1, and either Bacteriology 2 (especially relevant), Botany 2, or Zoology 2. An introduction to genetics, covering the areas of classical molecular and biochemical, and developmental genetics. Not open for credit to students who have received credit for Genetics 115 or 120.

100B. Principles of Genetics (3) II, Prout

Lecture—3 hours; or autotutorial—2 hours and general assembly—1 hour. Prerequisite: course 100A; a course in statistics. Continuation of course 100A, covering topics of cytogenetics, quantitative, population, and evolutionary genetics. Not open for credit to students who have received credit for Genetics 115 or 120.

100L. Principles of Genetics Laboratory (1) II, III. Green Laboratory—3 hours. Prerequisite: course 100A, 115, or 120; Bacteriology 3. Laboratory work in basic genetics to supplement courses 100A, 100B, 115, and 120.

101. Cytogenetics (3) III Rick (Vegetable Crops), Dvorak (Agronomy and Range Science)

Lecture—3 hours. Prerequisite: course 100B, 115, or 120. Gross and fine-structure of chromosomes and associated cell organelles, chromosome reproduction; behavior of chromosomes as related to genetics and evolution in polyploids, aneuploids, and structural heterozygotes. Offered in odd-numbered years.

101L. Cytogenetics Laboratory (2) III. Snow, Dvorak (Agronomy and Range Science)

Laboratory—6 hours. Prerequisite: course 101 (may be taken concurrently). Laboratory study of chromosome structure and behavior. Offered in odd-numbered years.

102. Molecular and Biochemical Genetics (3) I, Kiger

Lecture—3 hours. Prerequisite: course 100A or 120; Biochemistry 101B. Study of gene structure, mutation and the biochemical basis of gene function.

103. Organic Evolution (3) III. Ayala

Lecture—3 hours. Prerequisite: course 100B, 115 or 120. Evolutionary processes in higher organisms.

104. Developmental Genetics (4) II. Kiger

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A, 115, or 120; Biochemistry 101B; Zoology 100 recommended. Modern concepts of the development and differentiation of vertebrates and other higher organisms. Emphasis is placed on genetic and biochemical approaches to the study of control mechanisms operative at the various levels of gene action.

105. Population Genetics (4) I. Allard

Lecture—4 hours. Prerequisite course 100B, 115, or 120; a course in statistics and Mathematics 16B recommended. An introductory course in the analysis and interpretation of

quantitative genetic systems. Course covers Mendelism in populations, with emphasis on the factors affecting the genetic organization of multicocus systems.

108. Philosophy of the Biological Sciences (4) III. Ayala
Lecture-discussion—4 hours. Scientific method in biology. Nature of biological theories, explanations, and models. Problems of evolutionary theory, ecology, and sociobiology. Bio-engineering and environmental ethics. (Same course as Environmental Studies 108 and Philosophy 108.)

115. Human Genetics (5) III. The Staff

Lecture—4 hours; discussion—1 hour. Prerequisite: introductory course in zoology, botany, or biology; a course in statistics; upper division standing. Introduction to genetics with special emphasis on man. Course will fulfill the needs of preprofessional students and those in other areas of human biology. Not open for credit to students who have received credit for Genetics 100A-100B or 120.

120. General Genetics (4) I, Rodriguez, Hansche; II, Snow, Gillespie; III, Boyd, Hansche

Lecture—4 hours. Prerequisite: Biological Sciences 1; Bacteriology 2, Botany 2, or Zoology 2; a course in statistics. Course is designed to provide an intensive treatment of the science of genetics for students in the biological sciences who require only a short course in general genetics. Not open for credit to students who have received credit for Genetics 100A-100B or 115.

180L. Advanced Molecular Genetics Laboratory (3) I, Rodriguez

Laboratory—9 hours. Prerequisite: courses 100L, 102 (may be taken concurrently), Biochemistry 101L, and consent of instructor; Bacteriology 130L recommended. Genetic analysis of gene structure and function using recombinant DNA technology. Experiments will involve the isolation of prokaryotic genes for the purpose of demonstrating the genetic principles of complementation, mutation and suppression.

197T. Tutoring in Genetics (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: upper division standing and consent of instructor. Conducting of discussion groups affiliated with one of the department's regular courses. (P/NP grading only.)

198. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Directed group study of special topics in 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 based on adequate preparation of the student in allied fields. (P/NP grading only.)

Graduate Courses

202. Plasmids, Recombinant DNA, and Genetic Engineering (3) II. Edlin

Lecture—3 hours. Prerequisite: course 102 or Bacteriology 130A-130B, or consent of instructor. Presentation of recent experiments in recombinant DNA technology. Description of biochemical and genetic properties of bacterial plasmids. (S/U grading only.) Offered in odd-numbered years.

203. Advanced Evolution (3) III. Gottlieb

Lecture—1 hour; discussion—2 hours. Prerequisite: graduate status. Adaptation, ecological differentiation, and speciation in plants and animals with emphasis on the appropriateness of different methods of analysis. Offered in odd-numbered years.

205. Theoretical Population Genetics (3) II. Turelli

Lecture—3 hours. Prerequisite: course 105; Mathematics 22A, and 130A or 131A, or consent of instructor; Mathematics 22B recommended. Mathematical theory of population genetics with emphasis on the assumptions underlying the standard models and the mathematical techniques used to derive conclusions. (S/U grading only.) Offered in odd-numbered years.

***206. Current Topics in Genetics** (3) III.

Lecture—2 hours; laboratory or discussion—2 hours. Prerequisite: course 100B or 115 or consent of instructor. Selected topics of current interest in advanced genetics. May be repeated for credit.

***207. Genetic Control of Insect Pests** (3) I, Prout

Lecture—3 hours. Prerequisite: elementary genetics plus population genetics or evolutionary theory; graduate or upper division standing in biological science; some knowledge of insect ecology and model construction recommended. The application of population genetic theory to ways of altering the genetic constitution of pest populations; including sterile male release, delayed sterility methods, sex ratio distortion, the use of various cytogenetic proce-

dures and meiotic drive to transform populations. Offered in odd-numbered years. Same course as Entomology 207. (S/U grading only.)

***288. DNA Replication, Recombination, and Repair** (3) III. Boyd, Snow

Lecture—2 hours; discussion—1 hour. Prerequisite: Genetics 102; Biochemistry 101B. An integration of information from genetic and biochemical studies of DNA replication and repair, and from studies of recombination, with the aim of forming a framework for understanding these phenomena as aspects of DNA metabolism. Offered in even-numbered years.

298. Group Study (1-5) I, II, III. The Staff

Prerequisite: consent of instructor. Directed group study of special topics in genetics. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff

(S/U grading only.)

Genetics (A Graduate Group)

S. Richard Snow, Ph.D., Chairperson of the Group
Group Office, 357 Briggs Hall

Graduate Study. The Graduate Group in Genetics offers programs of study and research leading to the M.S. and Ph.D. degrees. For detailed information regarding the programs, address the chairperson of the group.

Graduate Advisers. Consult Genetics Graduate Group Office, 357 Briggs Hall.

Related Courses. See Genetics and Animal Genetics

Courses in Genetics

Graduate Courses

291. Seminar in History of Genetics (2) II. The Staff
Seminar—2 hours. Prerequisite: Genetics 100B, 115, or 120. The development of modern genetic theories beginning with Mendel. (S/U grading only.)

292. Seminar in Gene Structure and Action (1-3) III. The Staff
Seminar—1-3 hours. Prerequisite: Genetics 102 or consent of instructor. Topics of current interest related to the structure of genes, mutation, and the mechanisms of gene action. Offered in odd-numbered years. (S/U grading only.)

***293. Seminar in Cytogenetics and Evolution** (1-3) I. The Staff

Seminar—1-3 hours. Prerequisite: Genetics 101 or consent of instructor. Topics of current interest related to chromosomal changes, mutation, and other genetic changes in natural populations, and the application of genetics to the study of organic evolution. Offered in odd-numbered years. (S/U grading only.)

***294. Seminar in Populational, Ecological, and Behavioral Genetics** (1-3) II. The Staff

Seminar—1-3 hours. Prerequisite: Genetics 103 and 105 or consent of instructor. Topics of current interest relating genetics to problems of populations, ecology, and behavior. Offered in even-numbered years.

298. Group Study (1-5) I, II, III. Members of Group (Chairperson in charge)

Prerequisite: consent of instructor. Directed group study of special 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)

Stephen C. Jett, Ph.D., Chairperson of the Department

Department Office, 280 Kerr Hall

Faculty

- Conrad J. Bahre, Ph.D., Assistant Professor
- Dennis J. Dingemans, Ph.D., Assistant Professor
- Howard F. Gregor, Ph.D., Professor
- Louis E. Grivetti, Ph.D., Assistant Professor (Geography, Nutrition)
- *David M. Helgren, Ph.D., Assistant Professor
- Stephen C. Jett, Ph.D., Professor
- Marlyn L. Shelton, Ph.D., Assistant Professor
- *Frederick J. Simoons, Ph.D., Professor
- Kenneth Thompson, Ph.D., Professor

The Major Program

Geography is the study of the forms, origins, locations, and distributions of phenomena on the earth's surface. Its emphasis is spatial, and it is concerned with the processes and events involved, over time, in the development of earth's natural and human geography. Geography draws information from many other academic fields in its attempts to describe and explain earth's diverse regional character and spatial patterns. It is, then, a broad, interdisciplinary field, but students are encouraged to develop, in upper division work, a degree of specialization in one of geography's sub-fields—physical, cultural/historical, or urban/economic—supplemented by related courses in other departments. Programs are planned in consultation with the major adviser.

Geography's approach is largely academic, but provides background for students interested in careers in teaching, planning, and international affairs.

Geography

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	12
Geography 1, 2, and 5	12
Depth Subject Matter	39-42
Choose one emphasis from the following four:	
<i>Emphasis I (General)</i>	28
One course from each of the following three groups:	
a. Geography 170 and 171	
b. Geography 141 and 155	
c. Geography 108 and 115	
Four additional upper division geography courses.	
<i>Emphasis II (Cultural/Historical)</i>	28
Geography 170, 171, plus one course from 108, 115, 141, 155.	
Four additional courses chosen from Geography 103, 110, 143, 152, 154, 172, 173, 174, 175.	
<i>Emphasis III (Economic/Urban)</i>	27-28
Geography 110, 141, 155, plus one course from 108, 115, 170, 171.	
Three additional courses chosen from Geography 104, 142, 143, 154, 156, 161, 162.	

Emphasis IV (Physical) 30
 Geography 3, 108, 110, 115, 162, 173, plus one course from 141, 155, 170, 171.
 One additional course from Geography 102, 111, 112, 117, 161.

Geography 105 or 106 and 151, plus at least one UCD regional course chosen from Geography 121, 122A, 122B, 123A, 123B, 124, 125A, 125B, 126 12

Total Units for the Major 51-54

Recommended
 Geography 4.

Geography

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	56-60
Geography 1, 2, 3, and 5	15
Statistics 13 or the equivalent	4
Mathematics 16A, 16B, and 16C; or Mathematics 21A, 21B, and 21C	9-12
Mathematics 19 or 29	3
Chemistry 1A-1B-1C or 4A-4B-4C	15
Biological Sciences 1	5
Zoology 2-2L or Botany 2 or Geology 60-60L or Physics 2A-2B	5-6
Depth Subject Matter	43-45
Geography 105, 106, 108, 115, 151	20
Two courses from Geography 110, 111, 112, 117, 162, 173	6-8
One course from Geography 121, 122A, 122B, 123A, 123B, 124, 125A, 125B, 126	4
Four additional upper division, letter-graded units in Geography	4
Nine additional upper division units chosen in consultation with undergraduate adviser	9
Total Units for the Major 99-105	

Recommended
 Geography 4; Physics 8A-8B-8C; Chemistry 8A, 8B; Mathematics 15 or the equivalent.

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:

	UNITS
Geography	20
Upper division units in geography chosen in consultation with major adviser	20

Major Adviser. See *Class Schedule and Room Directory*.

Teaching Credential Subject Representative. D.J. Dingemans. See page 105 for the Teacher Education Program.

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

Lower Division Courses

1. Physical Geography (4) I, III, Helgren; II, Jett
 Lecture—3 hours; laboratory—2 hours. Basic physical elements of the human habitat, especially climate, landforms, soils, and natural vegetation.

2. Introduction to Cultural Geography (4) I, II. Simoons
 Lecture—4 hours. Traditional systems of habitat use: their characteristics, origin, occurrence, ecology. Development of contemporary cultural patterns and problems in man-land relationships. Emphasis on the nonindustrial world.

3. Climate and Weather (3) I, II, III. Shelton
 Lecture—3 hours. 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) II. 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 (4) I, III, Gregor; II, Dingemans
 Lecture—3 hours; discussion—1 hour. The location of economic and urban activities. Patterns and theories of spatial organization: resource development, agricultural and manufacturing regions, urban systems, and urban structure.

6. Man's Role in Changing the Face of the Earth (4) I, III, Thompson
 Lecture—4 hours. Man's influence on world geography and ecology. The effects of human occupation and activities on the environment, especially the landscape.

7. Problems in Regional Ecology (4) II. Simoons
 Lecture—4 hours. Selected historical and contemporary ecological problems from various parts of the world. Emphasis on interaction between cultural and physical environments. Regions selected from areas of faculty specialization.

10. The World's Regions (3) I. The Staff (Chairperson in charge)
 The major geographic regions of the world; their origins, physical environments, cultures and economies; their interactions and global roles. Designed for non-majors.

***11. Cultural Geography of Black America** (4) II.
 Lecture—4 hours. Geographic origins, dispersals, and adaptations of blacks in the New World.

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)
 (P/NP grading only.)

Upper Division Courses

***102. Field Course in Physical Geography** (4) III.
 Lecture and field trip—one day per week. Prerequisite: courses 1 and 2 and consent of instructor. Research methodology and field study. Systematic mapping and analysis of elements of the natural landscape.

***103. Field Course in Human Geography** (4) III.
 Lecture and field trip—one day per week. Prerequisite: courses 1 and 2 and consent of instructor. Research methodology and field study. Systematic mapping and analysis of elements of the cultural landscape.

104. Field Course in Urban Geography (4) III. Dingemans
 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) III. Bahre
 Lecture—1 hour; laboratory—6 hours. Compilation and

NOTE: For key to footnote symbols, see page 130.

Geography

generalization of base-map data; symbolization and processing of map data; cartographic design and lettering techniques; map reproduction.

106. Interpretation of Aerial Photographs (4) II. Bahre
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 1, 105, or consent of instructor. Basic photogrammetry, analysis of landscape from conventional aerial photographs, and remote sensing.

***107. Advanced Cartography** (4) III. Bahre
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 105. Advanced cartographic representation of statistical and field data. New and innovative techniques in mapping systems.

108. Analysis of Landforms (4) III. Helgren
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) II. 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.

***111. Rivers and Alluvial Landscapes** (4) III. Helgren
Lecture—3 hours; discussion—1 hour. Prerequisite: course 108, or consent of instructor. Examination of the morphology, sedimentology, and genesis of alluvial landscapes. Analyses of fluvial processes and related landforms in channelways, on floodplains and on valley margins. Techniques of paleo-landscape identification: river terraces, soil and alluvial stratigraphies, paleohydrology and dating methods. Offered in odd-numbered years.

***112. Coastal Landforms and Landscapes** (4) II. Helgren
Lecture—3 hours; discussion—1 hour. Prerequisite: course 108 or consent of instructor. Examination of the landforms and geomorphic processes found at coasts. Analyses of coasts in a variety of lithologic, tectonic, and "wave climate" settings. Emphasis on the Quaternary history of coastal landscapes. Offered even-numbered years.

***115. Mesoclimatology** (4) III. Shelton
Lecture—3 hours; term paper. Prerequisite: course 3. Examination of 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. Climate and related processes in areal systems. Man's alteration of mesoclimates.

117. Quaternary Environments (3) I, Helgren
Lecture—3 hours. Prerequisite: course 1, or Biological Sciences 1 or consent of instructor. Introduction to character, timing and magnitude of environmental changes during the Quaternary (Pleistocene and Holocene). Analysis of methods of paleo-environment identification. Survey of Quaternary record for selected regions.

***119. Arid Lands** (4) I, Jett
Lecture—4 hours. Prerequisite: course 1 or consent of instructor. Physical characteristics and human utilization of rainfall-deficient regions.

***121. North America** (4) I, Gregor
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Natural and economic regions of the United States and Canada.

122A. Middle 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.

***122B. South America** (4) I, Bahre
Lecture—3 hours; term paper. Prerequisite: courses 1 and 2 or consent of instructor. Environment, culture, and economy in the South American countries.

***123A. Western Europe** (3) II, Thompson
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.

***123B. Eastern Europe** (4) II
Lecture—3 hours; discussion—1 hour. 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 Eastern Europe.

***124. The Soviet Union** (4) II, Dingemans
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Physical landscapes and cultural regions of U.S.S.R.

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** (4) II, Simoons
Lecture—4 hours. Prerequisite: courses 1 and 2 or consent of instructor. Physical, cultural, and historical geography of Africa south of the Sahara.

***126. Southern Asia** (4) II, Simoons
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2, or consent of instructor. Physical, cultural, and historical geography of Southern Asia.

***127. Geography of Contemporary China** (4) III, Dingemans
Lecture—3 hours. Prerequisite: course 1 and 2 or consent of instructor. A review of physical and human environments in China. The location of resources, agriculture, industry, and cities. The contemporary socioeconomic system as it modifies traditional rural and urban landscapes. Analysis of China as one model of economic development.

131. California (4) III, Gregor
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) II, Gregor
Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. Survey of the principal environmental, 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, Gregor
Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. Spatial analysis of the world agricultural area: inner and outer limits, functional and morphological variations, and contributing physical and human forces. Regional typologies. Offered in odd-numbered years.

143. Political Geography (4) II, Thompson
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) I, Thompson
Lecture—3 hours; term paper. Prerequisite: three upper division courses in geography. The literature of geography: objectives, subdivisions, and development of the subject.

***152. Geographical Discovery and Exploration** (4) II, Thompson
Lecture—4 hours. Expansion of western world's geographical horizons from ancient through modern times.

***154. Geography of Settlement** (4) III
Lecture—3 hours; term paper. Prerequisite: courses 2 and 5 or consent of instructor. Evolution of settlements; morphology and function of settlements; determinants of settlement patterns; theories of settlement systems. Emphasis on rural settlement features and non-western settlements.

155. Urban Geography (4) I, 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 system and residential structure.

***156. The Urban Region** (4) II, 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.

161. Conservation of Resources and Environment (4) III, 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 (3) I, Shelton
Lecture—3 hours. 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.

***170. Cultural Ecology** (4) II, Jett
Lecture—3 hours; term paper. Prerequisite: course 2 or Anthropology 2. Geographic theories of environment-man relations. Ecologic relations of gatherers, fishermen, hunters, cultivators, and urbanites; their environmental impacts; their domestic plants and animals.

171. Cultural Geography (4) II, Simoons
Lecture—4 hours. Prerequisite: course 2 or consent of instructor. Consideration of the principal approaches to cultural geography in modern times, including environmental determinism and possibilism, regional geography, cultural history, cultural ecology, and environmental perception.

***172. Animals and Culture History** (4) I, Simoons
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. Man and Vegetation Change (4) I, Bahre
Lecture—3 hours; term paper. Prerequisite: course 1 or 2, or consent of instructor. Environmental and cultural relationships of the world's principal vegetation patterns. Particular emphasis on land-use practices and vegetation change.

***174. Geography of Prehistory** (4) III, Helgren
Lecture—3 hours; written assignments. Prerequisite: course 2, Anthropology 3, or consent of instructor. The relationships between prehistoric societies and their environments. The spatial patterning of prehistoric societies. Analysis and synthesis of environmental and spatial data from archeological sites.

***175. Geography of Food and Diet** (4) II, Grivetti, Simoons
Lecture—4 hours. Prerequisite: course 2 or Anthropology 2, Nutrition/Food Science and Technology 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 odd-numbered 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 an undergraduate Geography 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—3 hours. Prerequisite: graduate status in geography. 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.

***250. Theory and Method in Geography** (4) III.
Lecture—2 hours; discussion—1 hour.

***256. Regional Economic Organization** (4) III.
Seminar—3 hours. Analysis of theories of spatial organization, and examination of their applicability to selected examples of regional economic development.

***290. Seminar: Selected Regions** (4) I, Thompson
Seminar—3 hours. Region to be announced annually.

291. Seminar in Cultural Geography (4) III, Jett
Seminar—3 hours.

292. Seminar in Landform Analysis (4) I, Helgren
Seminar—3 hours.

***293. Seminar in Political Geography** (4) I, Thompson
Seminar—3 hours.

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) I, Gregor Seminar—3 hours.
- *297. **Seminar in Industrial Geography** (4) III, Gregor 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.)

Professional Course

*300. **Problems in Teaching Geography** (2) III, Thompson Lecture—2 hours. Prerequisite: course 1 or 2. Establishing, organizing, and conducting courses in geography and regional study. Designed primarily for prospective elementary and secondary school teachers of the social sciences. (P/NP grading only for undergraduates and S/U for graduate students.)

Geology

(College of Letters and Science)

Jere H. Lipps, Ph.D., Chairperson of the Department
 Department Office, 175 Physics-Geology Building

Faculty

- Richard Cowen, Ph.D., Professor
- Howard W. Day, Ph.D., Assistant Professor
- Cordell Durrell, Ph.D., Professor Emeritus
- Harry W. Green II, Ph.D., Professor
- Anthony Hallam, Ph.D., Visiting Professor
- Charles G. Higgins, Ph.D., Professor
- Bruce Hobbs, Ph.D., Visiting Professor
- Jere H. Lipps, Ph.D., Professor
- Ian D. MacGregor, Ph.D., Professor
- Robert A. Matthews, A.B., Lecturer
- Eldridge M. Moores, Ph.D., Professor
- Jeffrey F. Mount, Ph.D., Assistant Professor
- Dennis R. Ojakangas, Ph.D., Lecturer
- Bruce E. Taylor, Ph.D., Assistant Professor
- Bennie W. Troxel, M.A., Lecturer
- *Robert J. Twiss, Ph.D., Associate Professor
- Kenneth L. Verosub, Ph.D., Associate Professor
- Peter D. Ward, Ph.D., Assistant Professor

The Major Programs

Students interested in becoming professional geologists and continuing their geological studies at the graduate level should elect the program leading to the Bachelor of Science degree. Students desiring a less intensive program in geology as part of their general education or as preparation for nonprofessional careers in geology may elect the program leading to the Bachelor of Arts degree. High school students should note that the preparation for either degree is simplified if their high school programs include chemistry and four years of mathematics. In either program additional courses may be selected for emphasis in physical or environmental geology.

Geology

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	38-40
Zoology 2 or Geology 3-3L	4
Chemistry 1A-1B or 4A-4B	10
Geology 50, 50L, 60, 60L	10
Mathematics 16A-16B or 21A-21B	6-8
Physics 2A, 3A, 2B, 3B	8

Depth Subject Matter	36
Geology 102, 105, 105L, 106, 106L, 107, 107L, 108, 108L, 122	29
Additional upper division units in geology and related fields approved by the major adviser	7
Total Units for the Major	74-76

Recommended
 Chemistry 1C or 4C; Geology 2, 2L, 3, 3L;
 Mathematics 15; Statistics 13.

Geology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	56
Zoology 2 or Geology 3-3L	4
Chemistry 1A-1B-1C; or preferably 4A-4B-4C	15
Geology 50, 50L, 60, 60L	10
Mathematics 21A, 21B, 21C	12
One course from Mathematics 22A, 22B, 22C	3
Physics 8A-8B-8C, or 2A-2B-2C and 3A-3B-3C	12
Depth Subject Matter	49
Geology 102, 105, 105L, 106, 106L, 107, 107L, 108, 108L, 118, 122, 123, 124	47
Geology 190 (repeat course at least once)	2
Total Units for the Major	105

Recommended
 Geology 2, 2L, 3, 3L;
 Mathematics 15; Statistics 13.

Major Advisers. C. G. Higgins (A.B. and B.S. degrees); and R. A. Matthews, K. L. Verosub (B.S. degrees).

Minor Program Requirements:

Letters and Science students in other disciplines may elect to complete a minor in one of the geological subjects listed below. Such minors may be posted on transcripts to show competence in the ancillary field chosen.

	UNITS
Geology (General)	23
Geology 50, 50L, 105, 105L, 106, 106L, 107, 107L	20
Geology 108 or 150B	3

Minor Advisers. C. G. Higgins, K. L. Verosub.

	UNITS
Economic Geology	21-23
Geology 115, 117A, 117B, 120, 130, 170	18
One course chosen from Economics 123, Engineering 160, Geology 152, 180, 181	3-5

Minor Adviser. B. E. Taylor.

	UNITS
Engineering Geology	21
Civil Engineering 171, 172	5
Geology 117A, 117B, 134, 175	12
Soil Science 118	4

Minor Adviser. R. A. Matthews.

	UNITS
Environmental Geology	23-24
Geology 130, 134, 152, 175	13
Soil Science 118	4
Water Science 141	3
One course chosen from Environmental Studies 160, 171, 179	3-4

Minor Adviser. R. A. Matthews.

	UNITS
Geochemistry	22-23
Chemistry 110A, 110C	6
Geology 60, 60L, 115, 180	13
One course chosen from Chemical Engineering 151, Chemistry 126, Engineering 130, 134, Geology 150A, Soil Science 102, Water Science 180	3-4

Note: Chemistry majors must substitute one of the elective courses for Chemistry 110C.

Minor Adviser. B. E. Taylor.

	UNITS
Geomorphology	20-21
Geology 106, 134, 152, 153	14
Soil Science 120, 120L	3
At least one course chosen from Civil Engineering 171, Geography 111, 112, 117, Soil Science 121	3-4

Minor Adviser. C. G. Higgins.

	UNITS
Geophysics	21-24
Geology 117A, 117B, 181	9
Applied Science Engineering 115	3
One course sequence chosen from the following	9-12
Atmospheric Science 120, 121A, 121B; or Electrical and Computer Engineering 112, 151, 160, or Geology 105, 162, Engineering 148; or Mathematics 128A, 128B, 128C; or Physics 104A, 104B, 105C.	

Minor Adviser. K. L. Verosub.

	UNITS
Oceanography	19-24
Geology 106, 116, 150A, 150B, 150C	16
One course chosen from Environmental Studies 100, 151, Geology 111A, 111B, S119, Water Science 180	3-8

Minor Adviser. P. D. Ward.

	UNITS
Paleobiology	20-24
Botany 140	4
Geology 107, 107L, 111A, 111B	13
At least one course chosen from Anthropology 152, Botany 142, 143, Genetics 103, Geology 138, 150C, S119, Zoology 112A, 112B, 125, 147, 148, 149	3-7

Minor Adviser. P. D. Ward.

Teaching Credential Subject Representative. C.G. Higgins. See page 105 for the 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. H. W. Green, I. D. MacGregor.

Courses in Geology

Lower Division Courses

1. Evolution of Earth (3) I, Cowen; III, Ward
 Lecture—3 hours. Intended for those not majoring in geology or associated sciences. Origin and physical development of the Earth through geologic time, and the processes and materials that formed it.

1L. Evolution of the Earth Laboratory (1) I, Cowen; III, Ward
 Laboratory—3 hours. Prerequisite: course 1 (concurrently). Intended for those not majoring in geology or associated sciences. The materials (rocks and minerals), structures (faults and folds), and processes (sea floor spreading and continental drift) that formed the Earth, illustrated by laboratory and field exercises.

2. Landforms (3) II, Higgins
 Lecture—3 hours. Prerequisite: course 1 recommended. Landforms and landscapes—the sculpture of the Earth's surface by natural processes.

2L. Landforms Laboratory (1) II, Higgins
 Laboratory—3 hours. Prerequisite: courses 1L and 2 (preferably taken concurrently). How to study and interpret landforms geologically; an introduction to some of the geomorphologist's tools—maps, models, aerial photographs, and the landscape around us.

3. History of Life (3) II, Cowen
 Lecture—3 hours. Prerequisite: course 1 recommended. The history of life during the three 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.

NOTE: For key to footnote symbols, see page 130.

Geology

- 3L. History of Life Laboratory** (1) II. Cowen
Laboratory—3 hours. Prerequisite: course 3 (concurrently). Exercises in understanding fossils as the clues to interpreting ancient life, including their functional morphology, paleoecology, and evolution.
- 16. The Physical Earth and Man** (3) III. Matthews
Lecture—2½ hours; discussion—½ hour. The problem of non-renewable natural resources. Their role in technology and society; their availability, rates of depletion, and the probable impact on society of their exhaustion.
- 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) III. Matthews
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.
- 50. Physical Geology** (3) III. Moores
Lecture—3 hours. Prerequisite: high school physics and chemistry. A rigorous introduction to physical geology for majors in geology and associated sciences. History of the earth and solar system; geologic time; Earth's interior; plate tectonics; crustal deformation; rocks and minerals; weathering, erosion and sedimentation; volcanism, plutonism and metamorphism.
- 50L. Physical Geology Laboratory** (2) III. Moores
Laboratory—6 hours; one or two one-day field trips. Prerequisite: course 50 (preferably taken concurrently). Laboratory work to illustrate topics in course 50. Emphasis on introduction to classification and recognition of minerals and rocks, and on reading topographic and geologic maps.
- 60. General Mineralogy** (3) III. Day
Lecture—3 hours. Prerequisite: high school chemistry. Crystallography; physical and chemical structure and properties of minerals; mineral genesis.
- 60L. General Mineralogy Laboratory** (2) III. Day
Laboratory—6 hours; two one-day field trips. 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. Troxel, Matthews
Lecture—1 hour; field work—8 full days; final report. Prerequisite: courses 105L, 106L, 123; 124 (may be taken concurrently). Introduction to geologic field study, tools, methods, geologic mapping, and preparation of reports.
- 105. Structural Geology** (3) I, Green
Lecture—3 hours. Prerequisite: courses 50, 50L; Physics 2A or 8A; 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. Structure Geology Laboratory** (2) I, Green
Lecture—1 hour; laboratory—2 hours; two or three one-day field trips and reports. Prerequisite: course 105 (concurrently), high school trigonometry and geometry. Graphical solutions to structural problems, introduction to field methods and field mapping, interpretation of geologic maps.
- 106. Ancient Environments** (3) II. Mount, Ward
Lecture—3 hours. Prerequisite: course 50, background in sedimentology, or consent of instructor. Study of modern and ancient environments; processes and geologic records of mountains, plains, coasts, shallow seas, and deep oceans. Ecology and the fossil record as a key to past environments; introduction to stratigraphic principles and methods.
- 106L. Ancient Environments Laboratory** (2) II. Mount, Ward
Laboratory—6 hours; two or three one-day field trips. Prerequisite: courses 50L, 106 (preferably taken concurrently). Introduction to stratigraphic procedures, identification of environmentally diagnostic rocks and fossils, problems of making geologic maps, recognition of ancient environments in the field.
- 107. Principles of Paleobiology** (3) III. Cowen, Lipps
Lecture—3 hours. Prerequisite: Zoology 2. The evolution and ecological structure of the biosphere from the origin of life to the present, with special emphasis on the oceanic environment during the last 600 million years.
- 107L. Principles of Paleobiology Laboratory** (2) III. Cowen, Lipps
Laboratory—6 hours (including two all-day field trips). Prerequisite: Zoology 2; course 107 (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) II. Moores
Lecture—3 hours. Prerequisite: courses 105, 105L, 106, 106L. 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) II. Moores
Lecture—1 hour; laboratory—2 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, Ward
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and ecology of the major phyla of invertebrates.
- 111B. Paleobiology of Protista** (4) II. Lipps
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and ecology of single-celled organisms.
- 113. The Solar System** (3) II. Verosub
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.
- 115. Geochemistry** (3) I, Taylor
Lecture—3 hours. Prerequisite: Chemistry 1A (may be taken concurrently); course 50. Application of principles 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. Offered in even-numbered years.
- 116. The Oceans** (3) II. Ward, Powell (Environmental Studies)
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; man's utilization of marine resources. (Same course as Environmental Studies 116.)
- 117A. Geophysics I: Gravity and Magnetism** (3) II. Verosub
Lecture—3 hours; field experience with geophysical instruments. Prerequisite: Physics 8B and Mathematics 21C or consent of instructor. Introduction to the use of physics in the study of earth structures and processes: gravity, paleomagnetism, geomagnetism. Application to geophysical exploration as well as solid earth geophysics.
- 117B. Geophysics II: Seismology and Heat Flow** (3) III. Verosub
Lecture—3 hours; field experience with geophysical instruments. Prerequisite: Physics 8B and Mathematics 21C or consent of instructor. Introduction to the use of physics in the study of earth structures and processes: seismology, heat flow, radioactive isotopes. Application to geophysical exploration as well as solid earth geophysics.
- 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.
- 120. Opaque Optical Mineralogy: Ore Microscopy** (2) II. Taylor
Lecture—1 hour; laboratory—3 hours. Prerequisite: courses 60 and 60L. Introduction to the techniques used to identify opaque minerals.
- 122. Optical Mineralogy** (4) I, Green
Lecture—2 hours; 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. General Petrology I** (5) II. MacGregor
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 122. Origin and occurrence of igneous and clastic sedimentary rocks. Laboratory exercises emphasize study of these rocks in hand specimen and thin section.
- 124. General Petrology II** (5) III. Day, Mount
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 122. Origin and occurrence of carbonate sedimentary rocks and metamorphic rocks. Laboratory exercises emphasize study of these rocks in hand specimen and thin section.
- 125. Igneous Petrology** (4) III. MacGregor
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 123 or consent of instructor. Origin and characteristics of igneous rocks and processes of the Earth, Moon, and terrestrial planets. Laboratory study of representative rock suites in hand specimen and thin section.
- 126. Sedimentary Petrology** (4) II. Mount
Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: courses 106 and 106L or consent of instructor; course 123 recommended. An advanced treatment of the origin, texture, composition, diagenesis, and classification of the major sedimentary rock types. Interpretative petrographic study of selected samples.
- 128. Metamorphic Petrology** (4) I, Day
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 124 or consent of instructor. Metamorphic processes. Origin and characteristics of metamorphic rocks. Laboratory study of representative rock suites in hand specimen and thin section.
- 130. Non-Renewable Natural Resources** (3) I, Matthews
Lecture—3 hours. Prerequisite: course 1 or 16. 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.
- 134. Environmental Geology and Land Use Planning** (3) II. Matthews
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.
- 138. Seminar in Stratigraphic Paleontology** (3) III.
Lecture—1 hour; seminar—2 hours. Prerequisite: courses 3, 3L, 106, and 106L. Introduction to zone and range concepts, geologic time, and pertinent aspects of codes of stratigraphic and zoological nomenclature. Participants analyze major evolutionary developments within animal, protistan and plant phyla as keys to geological age determinations.
- 150A. Physical and Chemical Oceanography** (4) I, Powell (Environmental Studies)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 116 or Environmental Studies 116; Physics 8C; 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 geochemical cycles. (Same course as Environmental Studies 150A.)
- 150B. Geological Oceanography** (3) II. Cowen, Lipps
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. Ward, ———
Lecture—3 hours. Prerequisite: Biological Sciences 1 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. (Same course as Environmental Studies 150C.)
- 152. Photogeology and Remote Sensing** (4) III. Higgins
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1L or 2L 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) I, Higgins
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 2 or Geography 1; courses 1L and 2L recommended. Landforms, landscapes, and processes that shape them. Introduction to geomorphic observation and theory.
- 162. Stress and Deformation** (4) I, Green
Lecture—3 hours; discussion—2 hours. Prerequisite: Mathematics 21C and Physics 8C; Mathematics 22A, 22C, and Physics 8B 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.

170. Geology of Ore Deposits (4) I, Taylor
Lecture—3 hours; laboratory—3 hours; four-day field trip (including weekend). Prerequisite: courses 60-60L and 105L. Examination of major metallic ore-types using principles of plate tectonics, structural geology, petrology, and geochemistry. Laboratory study of selected ore deposits. Offered in odd-numbered years.

175. Introduction to Geological Engineering (3) III, Shen (Civil Engineering), Matthews
Lecture—2 hours; laboratory—3 hours. Prerequisite: junior standing. Introduction to the principles of geology, and study of geologic features that affect engineering structures. Discussion of geological aspects of engineering construction problems by means of case history studies. (Same course as Civil Engineering 175.)

180. Instrumental Analysis (5) I, Taylor
Lecture—3 hours; laboratory—6 hours. Prerequisite: elementary chemistry and elementary physics. Theory of the generation and detection of x-rays as applied to the determination of crystal structures and the analytical chemistry of rocks, minerals, and other compounds. Laboratory sessions will be given on use of the x-ray diffractometer and electron microprobe both as a scanning electron microscope and analytical tool.

181. Geologic Applications of Computers (3) I, Ojakangas
Lecture—2 hours; laboratory—3 hours. Prerequisite: upper division standing and one upper division geology course or consent of instructor. Introduction to solution of geological and paleobiological problems by computer methods.

185. Advanced Field Geology (3-6) I, II, III, The Staff
Field work resulting in a written report. Prerequisite: course 118 or graduate standing in geology. Advanced problems and methods in geologic field studies. Preparation of a geologic report.

190. Seminar in Geology (1) I, II, III, The Staff
Discussion—1 hour; seminar—1 hour. 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)
Work-learn experience. Prerequisite: upper division standing; project approval prior to internship. Supervised work-learn experience in geology. May be repeated for credit for a total of 10 units. (P/NP grading only.)

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) I, Mount
Lecture—3 hours. Prerequisite: courses 105L and 106L 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.

209. Origin and Significance of Metamorphic Textures (4) II, Green
Seminar—3 hours; laboratory—3 hours. Prerequisite: course 128 recommended. Interpretation of metamorphic textures in terms of surface energy anisotropy, growth anisotropy, crystal deformation processes, and disequilibrium phenomena. Offered in even-numbered 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.

215. Advanced Geochemistry (3) II, Taylor
Lecture—3 hours. Prerequisite: course 115, Chemistry 110A or consent of instructor. Application of principles of physical and solution chemistry to hydrothermal fluids associated with geothermal systems, igneous and metamorphic rocks, and ore deposits. Principles and applications of nuclear chemistry to geology; radiogenic and stable isotope geochemistry. Trace element geochemistry. Offered in even-numbered years.

216. Tectonics (3) II, 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) III, Verosub
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 odd-numbered 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 odd-numbered years.

***220. Mechanics of Geologic Structures** (3) II, Twiss
Lecture—2 hours; seminar—1 hour. Prerequisite: course 162, or consent of instructor, and 105. Application of principles of continuum mechanics to understanding development of geologic structures such as folds, fractures, faults, dikes, cleavage, bondinage. Offered in even-numbered years.

***226. Advanced Sedimentation and Sedimentary Petrology** (4) I, Mount
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 126 or consent of instructor. Topical study of major sedimentary rock assemblages of stable platform areas and of regions of crustal instability in respect to depositional environments, depositional processes, and provenance. Laboratory study of selected suites of sedimentary rocks.

230. Geologic Report Writing (2) I, III, Troxel
Lecture-seminar—2 hours. Prerequisite: graduate standing in Geology and consent of instructor. Organization, style, format and contents of reports for geologic journals. Conversion of theses to geologic reports. Writing informative abstracts. Participants make analyses of published reports, write syntheses of published reports and write abstracts.

***236. Physical Geology of California** (2) I, II, III, Durrell
Seminar—2 hours.

250. Advanced Geochemistry Seminar (3) III, Taylor
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.

254. Phase Equilibria (3) III, MacGregor
Seminar—3 hours. Prerequisite: Chemistry 1C 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.

255. Genesis of Metamorphic Rocks (3) II, Day
Lecture—3 hours. Prerequisite: course 124, Chemistry 110A or consent of instructor. Physicochemical principles of metamorphic mineral assemblages and methods of interpreting the paragenesis of metamorphic rocks.

260. Paleontology (3) II, Hallam
Seminar—3 hours. Prerequisite: course 111A or 111B, or graduate standing in a biological science. Selected problems in paleontology. Subject to be studied will be decided at an organizational meeting.

263. Functional Morphology of Fossil Invertebrates (4) III, Cowen
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 111A or Zoology 112A. Principles and methods of functional analysis of fossils, with special reference to selected problems in invertebrate phyla.

269. Evolutionary Biology of Protista (3) I, Lipps
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. To be offered in even-numbered years.

270. Advanced Study of Ore Deposits (3) II, Taylor
Lecture—3 hours. Prerequisite: courses 122, 123, 124 and 170; course 270L (concurrently). Study of the mode of occurrence, geochemistry, petrology, and aspects of exploration of selected varieties of ore deposits. Principles

and applications of geochemistry in genesis of certain ore deposits. Offered in odd-numbered years.

270L. Advanced Ore Deposits Laboratory (3) II, Taylor
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 122, 123, 124, 170 or consent of instructor. Study of representative suites of ore specimens and associated rocks with transmitted and reflecting light microscopes. First part of laboratory deals with theory and uses the reflecting light microscope. Offered in odd-numbered years.

271. Seminar in Ore Deposits (3) III, Taylor
Seminar—3 hours. Prerequisite: course 170. Critical review of topics in ore deposits selected according to participants' particular interests, such as studies of particular types of ore deposits, tectonic settings, sulfide mineralogy, etc. May be repeated for credit. Offered in odd-numbered years.

280. Igneous Petrology (3) III, MacGregor
Seminar—2 hours; laboratory—3 hours. Prerequisite: course 123. Integrated laboratory, field study, and seminar on igneous processes and products.

281. Metamorphic Petrology Seminar (3) II, Day
Seminar—3 hours. Prerequisite: course 128; course 255 recommended. Selected topics in metamorphic petrology will vary (e.g., mass transport processes, tectonic settings, geothermometry, thermal structure of metamorphic belts, regional studies). May be repeated for credit. Offered in odd-numbered years.

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.)

***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.)

296. Advanced Problems in Tectonics (3) I, 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.)

German

(College of Letters and Science)

Valerie A. Tumins, Ph.D., Chairperson of the Department
*Peter M. Schaeffer, Ph.D., Vice-Chairperson of the Department

Department Office (German and Russian), 416 Sproul Hall

Faculty

Wilbur A. Benware, Ph.D., Associate Professor
Clifford A. Bernd, Ph.D., Professor
William M. Estabrook, Ph.D., Lecturer
*John F. Feizer, Ph.D., Professor
Roland W. Hoermann, Ph.D., Associate Professor
Winder McConnell, Ph.D., Assistant Professor
Karl R. Menges, Ph.D., Associate Professor
H. Guenther Nerjes, Ph.D., Associate Professor
Fritz Sammern-Frankenegg, Ph.D., Associate Professor
*Peter M. Schaeffer, Ph.D., Associate Professor

The Major Program

This major explores in depth the language, the literary developments, and the cultural trends in the

German

German speaking world. The program is designed in such a way as to accommodate students whose interest lies either in the pursuit of literary or linguistic studies. Accordingly the department offers a major program with emphasis on the literary movements from the beginnings to the present time as well as a program which focuses on the acquisition of language skills (reading, writing, speaking, understanding) within the framework of theoretical and historical courses in German linguistics. Both programs open possibilities for advanced study at the graduate level as well as career opportunities in fields such as international relations, business, the sciences and the arts.

German

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter (for both German Language and Literature)	4-22
German 1-2-3 or 1AT-2AT (or the equivalent)	0-18
German 4 or 6A-6B	4
Recommended: Linguistics 1.	
Depth Subject Matter	40
German Literature Emphasis	
German 101, 121A, 121B, 121C	16
German 102, 103 (must be taken in residence)	8
Additional upper division units in literature	16
Include one 4-unit course in comparative literature, another national literature, or in translation.	
German Language Emphasis	
German 101, 102,	8
German 104A, 104B	8
German 105 or 106	4
German 107 or 108	4
German 120, 121C	8
Additional upper division units chosen in consultation with the adviser	8
Total Units for the Major (both emphases)	40-62

Minor Program Requirements:

The Department offers a German Language minor and a German Literature minor. In addition, individualized minor programs may be designed upon consultation with the undergraduate adviser.

The minor program can be of particular importance to students who wish to round out their training in other fields through a foreign language or literature degree.

	UNITS
German Language	18-24
Choose courses numbered from	
German 100A through German 108	18-24
German Literature	18-24
Choose courses numbered from German 110 and above	18-24
One two-unit lower division course from German 50 to 52 may be counted.	

Undergraduate Adviser. W. A. Benware.

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 page 103.

Teaching Credential Subject Representative. W.M. Estabrook. See page 105 for the Teacher Education Program.

The Master of Arts Degree. The Department offers programs of study leading to the M.A. degree. A minimum of 36 units is required. Further information may be obtained by writing to the Graduate Adviser.

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 Graduate Adviser.

Graduate Adviser. K. R. Menges.

Courses in German

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 or 6A-6B.

1. Elementary German (6) I, II, III. Estabrook
Discussion—5 hours; laboratory—two ½-hour sessions. (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.)

1ATA-1ATB-1ATC. Individualized German (2-2-2) I-II-III. McConnell

The three segments of course 1AT correspond to course 1. Student-instructor contact consisting of individual tutoring and testing periods. Students may start at any point and complete one or more two-unit segments in a given quarter. (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 option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary German (6) I, II, III. Estabrook
Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 1.

2ATA-2ATB-2ATC. Individualized German (2-2-2) I-II-III. McConnell

The three segments of course 2AT correspond to course 2. Student-instructor contacts consisting of individual tutoring and testing periods. Students may start at any point and complete one or more two-unit segments in a given quarter.

3. Intermediate German (6) I, II, III. Estabrook
Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 2. Class discussions of events and life in Germany—present and past. Reading of modern short stories with inductive review of grammar.

4. Intermediate German (4) I, II, III. The Staff
Recitation—3 hours. Prerequisite: course 3. (Course 4 may be taken concurrently with 6A and/or 6B.) Review of grammatical principles by means of written exercises; expanding of vocabulary through readings of modern texts.

6A. Spoken German (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: course 3. (Courses 4 and 6B may be taken concurrently with or subsequent to 6A.) Conversational practice based on everyday vocabulary of modern spoken German. (P/NP grading only.)

6B. Spoken German (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: course 3. (Courses 4 and 6A may be taken concurrently with 6B.) Conversational practice based on everyday vocabulary of modern spoken German. Topics vary from course 6A. (P/NP grading only.)

10. Basic Reading German (4) I, Hoermann
Discussion—3 hours; translation project—1 hour. Intensive course for non-majors to provide reading proficiency with texts containing basic sentence patterns and standard general vocabulary. Completion of three-course sequence, 10 and one segment each of 11 (H, N, or S) and 12 (H, N, or S), satisfies Letters and Science College foreign language requirement. Students who have successfully completed the second or more advanced year of high school level course work in the 10th or higher grade may receive unit credit for this course on a P/NP grading basis only.

11H, 11N, 11S. Reading German (4) II. Hoermann
Lecture—1 hour; discussion—2 hours; translation project—1 hour. Prerequisite: successful completion of course 10 or the equivalent. Continuation of course 10, with specialized focus for upper division and graduate students in arts and humanities (11H), natural sciences (11N), or social sciences (11S). Reading selections will be appropriately representative. (P/NP grading only.)

12H, 12N, 12S. Advanced Reading German (4) III. Hoermann
Lecture—1 hour; discussion—2 hours; translation projects—1 hour. Prerequisite: successful completion of course 11H, 11N, or 11S. Continuation of course 11H, 11N, or 11S with specialized focus on more advanced texts. Outside

reading and translation projects in students' fields of specialization constitute the central element of the course. (P/NP grading only.)

49. Freshman Seminar (2) II. Hoermann
Discussion—2 hours. Knowledge of German not required. Inquiry into the intellectual roots of problems confronting today's students, particularly as illustrated in translation by such modern German literary figures as Nietzsche, Kafka, Hesse, Brecht, and Günter Grass. Enrollment limited. (P/NP grading only.)

50. Survey of German Culture in English Translation (2) I, Fetzner
Lecture—2 hours. 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 trends in Arts and Literature.

51. Masterworks of German Literature in English Translation, I (2) II. Hoermann
Discussion—2 hours. Knowledge of German not required. Representative masterworks in English translation, beginning with such heroic epics as the *Nibelungenlied* and courtly romances such as *Parzival* and *Tristan and Isolde*, through the baroque period, Enlightenment, Storm and Stress, Weimar classicism, and ending with literary fairytales of Romanticism (1830).

52. Masterworks of German Literature in English Translation, II (2) III. Hoermann
Discussion—2 hours. Knowledge of German not required. Representative masterworks in English translation, beginning with the psychological realism of Büchner's *Woyzeck*, progressing through Naturalism and Expressionism, culminating in works by Mann, Kafka, Rilke and Brecht, and terminating with existential and absurdist perspectives (1830 to present).

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

100A. Advanced German Conversation (2) I. The Staff (Chairperson in charge)
Discussion—2 hours. Prerequisite: course 4. Intensive conversational practice, accurate pronunciation, and language fluency.

100B. Advanced German Conversation (2) II. The Staff (Chairperson in charge)
Discussion—2 hours. Prerequisite: course 4. Intensive conversational practice, accurate pronunciation, and language fluency.

100C. Advanced German Conversation (2) III. The Staff (Chairperson in charge)
Discussion—2 hours. Prerequisite: course 4. Intensive conversational practice, 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. Discussions based on readings in a variety of German texts.

103. Advanced Composition and Conversation (4) I, II, III. The Staff
Discussion—3 hours; written reports. Prerequisite: course 102 or consent of instructor. Advanced essay writing and discussion of selected texts.

104A. Translation and Composition (4) II. The Staff (Chairperson in charge)
Discussion—3 hours; written reports. Prerequisite: course 103 or the equivalent. Exercises in German/English translation using literary and non-literary texts of different styles and linguistic difficulties. Exercises in German composition.

104B. Advanced Translation and Composition (4) III. The Staff (Chairperson in charge)
Discussion—3 hours; written reports. Prerequisite: course 104A or the equivalent. Exercises in English/German translation of literary and non-literary texts. Essay-writing and development of written mastery of the language.

105. German Phonology-Morphology (4) III. Benware
Discussion—3 hours; written or oral report. Prerequisite:

course 4; Linguistics 1 recommended. Modern German phonetics and the structure of the phonological system. Elementary morphological analysis. Offered in odd-numbered years.

106. History of the German Language (4) III. Benware
Discussion—3 hours; written reports. Prerequisite: course 105 or Linguistics 1 recommended. Survey of the development of the German language and study of its structure in historical perspective. Offered in even-numbered years. (Same course as Linguistics 106.)

107. German Syntax (4) II. Benware
Discussion—3 hours; written or oral reports; problem sets. Prerequisite: course 4 or the equivalent; Linguistics 1 recommended. An examination of major problems in describing Modern German sentence structure; competing theories of syntax as applied to German. Offered in odd-numbered years.

108. Varieties of Modern German (4) II. Benware
Discussion—3 hours; written or oral reports. Prerequisite: course 4 or consent of instructor. Relationship of standard High German to modern dialects; uses of modern German in various fields such as advertising, politics and ideology. Offered in even-numbered years.

110. Older German Literature in English Translation (4) I, McConnell

Discussion—3 hours; written reports. Prerequisite: upper division standing or consent of instructor. Knowledge of German not required. Course intended for non-majors. Analyses in English of works of German literature from the Middle Ages through the Reformation (*Nibelungenlied*, Gottfried's *Tristan und Isolde* or Wolfram's *Parzival*, lyric poetry, selections from works of Johann von Tepl, Conrad Celtis, Sebastian Brant, Erasmus, Luther). Offered in odd-numbered years.

111. Studies in Major Writers from the Seventeenth to the Twentieth Century (in English) (4) II. Hoermann

Discussion—3 hours; written reports. Prerequisite: upper division standing or consent of instructor. Knowledge of German not required. Course intended for non-majors. Study of principal works in English translation by one or more major authors such as Grimmelshausen, Lessing, Schiller, Goethe, Heine, Büchner, Hauptmann, Thomas Mann, Brecht, and Kafka. Content will alternate from quarter to quarter. Offered in even-numbered years.

112. Special Topics in German Literature (4) II. Schaeffer
Discussion—3 hours; written reports. Knowledge of German not required. Analysis of significant themes in German literature; myths, legends and fairytales; war and social unrest as literary topics; satire and humor in contemporary German literature. Offered in odd-numbered years.

113. Goethe's Faust (4) II. Nerjes
Lecture—3 hours; oral reports. Knowledge of German not required. Course intended for non-majors. The Faust tradition: from the legendary contemporary of Luther, the popular chapbook versions, Marlowe's drama to Goethe's world classic, Part I and II. Offered in odd-numbered years.

114. Hermann Hesse (4) III. Nerjes
Lecture—3 hours; additional readings and written reports. Knowledge of German not required. Course intended for non-majors. A study of the main ideas and issues of the principal novels, with emphasis on man's dualism and his search for self-knowledge and self-fulfillment. Discussion of such works as *Siddhartha*, *Steppenwolf*, *Narcissus and Goldmund*. Offered in even-numbered years.

115A. German Literature since 1945 (4) I, Menges
Lecture—3 hours; written reports—1 hour. 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. Knowledge of German not required.

115B. German Literature since 1945 (4) II. Schaeffer
Lecture—3 hours; written reports—1 hour. 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. Knowledge of German not required.

116. Intellectual Backgrounds of German Literature (4) III. Menges

Discussion—3 hours; written reports. Knowledge of German not required. Course intended for non-majors. Survey of German intellectual history from Leibniz to Heidegger with emphasis on literary aspects and influences, including authors such as Kant, Hegel, Schelling, Fichte, Schopenhauer, Nietzsche, Freud and Bloch. Offered in odd-numbered years.

120. Survey of German Culture (4) I, Fetzler
Discussion—3 hours; written reports. Prerequisite: course 4 or the equivalent. Major developments in such areas of German life as the arts, philosophical thought, social institutions, and political history. Offered in even-numbered years.

121A. Survey of German Literature Around 800 to Period of Baroque (4) I, McConnell
Discussion—3 hours; written report. Prerequisite: course 4 or 6A and 6B. Survey of German literature from Carolingian beginnings around 800 to the Baroque Period; emphasis on major works representative of various literary movements.

121B. Survey of German Literature from 1700 to 1848 (4) II. Menges
Discussion—3 hours; written reports. Prerequisite: course 121A or consent of instructor. Survey of German literature from the Enlightenment to "Biedermeier" with particular emphasis on classical and romantic movements in eighteenth and early nineteenth centuries.

121C. Survey of German Literature from 1850 to present (4) III. Menges
Discussion—3 hours; written reports. Prerequisite: course 121B or consent of instructor. Survey of German literature from beginnings of Realism (1850) to present; particular emphasis on emergence of modern and contemporary (postwar) literary developments.

122. The Medieval Period in German Literature (4) I, McConnell
Discussion—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. The literary-philosophical profile of the *Mittelhochdeutsche Blütezeit* in terms of the significant courtly and folk epics and the *Minnesang*. Readings in modern German. Discussion in German and English. Offered in odd-numbered years.

123. Literature of the Classical Age (4) II. Nerjes
Discussion—3 hours; written or oral reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. 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. Offered in even-numbered years.

126. Modern German Literature (4) III. Menges
Discussion—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. Selections from the significant works of major twentieth-century writers, such as Hesse, Mann, Kafka, Rilke, Brecht, Grass. Discussion in German and English. Offered in even-numbered years.

132. The German "Novelle" (4) III. Bernd
Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. Inquiry into the art of the "Novelle" through analysis of the materials and formal devices of representative authors from Goethe to Kafka. Discussion in German and English.

133. The German Drama (4) II. Fetzler
Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. 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. Discussion in German and English.

194H. Special Study for Honors Students (1-5) I, II, III. The Staff
Prerequisite: open only to honors students. Guided research leading to an honors paper.

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. Gothic (4) I, Benware
Seminar—3 hours. Knowledge of modern German not required. Phonology, grammar and reading of Gothic texts. Special topics including the relationships of Gothic to Indo-European and to the other Germanic languages. Offered in even-numbered years. (Same course as Linguistics 200.)

201. Old High German (4) II. Benware
Seminar—3 hours. Study of the beginnings of German as a written language through the reading of selected texts from the eighth through the eleventh centuries. A linguistic analysis of the dialects. Offered in odd-numbered years.

202. Middle High German (4) II, III. McConnell
Seminar—3 hours. Outline of grammar; selections from Middle High German epic and lyric poetry.

205. History of the German Language (4) I, Benware
Seminar—3 hours. Development of the German language with emphasis on the early periods, from Indo-European to Middle High German. (Same course as Linguistics 205.)

206A-206B-206C. Morphology and Syntax of Modern German (1-1-1) I-II-III. Benware
Discussion—1 hour. An examination of morphological processes and syntactic rules in the standard language. Emphasis on methods of analysis. (Deferred grading only, pending completion of sequence.)

210. Techniques of Literary Scholarship (4) I, Menges
Seminar—3 hours. The bibliographical, organizational, and methodological tools and resources for advanced, independent research.

240. Forms of German Verse (4) II. Sammern-Frankeneegg
Seminar—3 hours. The development of German verse from the Middle Ages to Gottfried Benn, with special emphasis on different techniques of text analysis and interpretation. May be repeated for credit with consent of instructor.

241. The German Drama (4) III. Menges
Seminar—3 hours. 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. 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.

249. Medieval Epic Literature (4) II. McConnell
Seminar—3 hours. Prerequisite: course 202 or consent of instructor. A critical analysis of selected epic poetry of the "Stauferzeit," such as *Parzival*, *Tristan und Isolde*, and the *Nibelungenlied*. All texts read in Middle High German.

250. Medieval Lyric Literature (4) III. McConnell
Seminar—3 hours. Prerequisite: course 202 or consent of instructor. A critical study of the great lyric poets of medieval Germany, such as Walther von der Vogelweide, Heinrich von Morungen, and Reinmar von Hagenau. All texts read in Middle High German.

251. Seminar in a Major Author (4) III. Bernd
Seminar—3 hours; written report. The course will concern the work of a major German author. May be repeated for credit with consent of instructor; actual content will vary from year to year.

252. The Writing of Lessing (4) I, Sammern-Frankeneegg
Seminar—3 hours. Study of Lessing's theory of literature with particular emphasis upon his critical attacks on French drama.

253. Goethe (4) II. Nerjes
Seminar—3 hours. Study of the origins of Goethe's thought in German Pietism, and his principal artistic autobiographical, scientific, and philosophical works.

254. Schiller (4) III. Nerjes
Seminar—3 hours. 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.

257. Heinrich von Kleist (4) III. Bernd
Seminar—3 hours. Kleist's important dramatic and prosaic 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. 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) I, Hoermann
Seminar—3 hours. Study of Kafka's narrative techniques with special emphasis in the shorter works on the existential development from its roots in expressionism. Offered in even-numbered years.

260. The Poetry of Rilke (4) I, Menges
Seminar—3 hours. 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. A reading of all works with emphasis on the ideas which impelled the development of new literary forms and concepts.

280. Survey of Eighteenth-Century German Literature (4) I, Nerjes
Seminar—3 hours; written report. A survey of the main trends and principal works or topical elements of eighteenth century German Literature, from the transitional writers to Gottsched and the Swiss theorists; Sentimentality and Anacreontic; from Klopstock to Lessing and the beginning of the Classical Age.

History

281. Survey of Nineteenth-Century German Literature (4) II. Sammern-Frankeneegg

Seminar—3 hours; written reports—1 hour. A survey of the main trends and topical elements in nineteenth-century German Literature from 1815 until the rise of naturalism with special emphasis on a developing concept of realism and its reflection in representative works by authors from Germany, Austria and Switzerland.

282. Survey of Twentieth-Century German Literature (4) III. Menges

Seminar—3 hours; written reports—1 hour. A survey of the main trends and principal works or topical elements of twentieth-century German Literature from Naturalism (Hauptmann), through Symbolism (Rilke, Hofmannsthal), *Neue Sachlichkeit* to literary developments after 1945 in East Germany, Switzerland, Austria and West Germany.

285. Middle High German Literature (4) III. McConnell

Seminar—3 hours. Prerequisite: course 202 or consent of instructor. An extensive reading of Middle High German texts in the original language. Examines linguistic and literary problems.

288. The Renaissance and Reformation in German Literature (4) I. Schaeffer

Seminar—3 hours. 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) III. Schaeffer

Seminar—3 hours. The "Elegantiadeal" and the varying methods used to portray it in seventeenth-century German literature. May be repeated for credit with consent of instructor.

290. The Enlightenment in German Literature (4) II. Nerjes

Seminar—3 hours. The revolt against the excesses of the "Elegantiadeal," and the 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. Nerjes

Reaction to overemphasis on Reason: the theories of Hamann and Herder and the 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, Nerjes

Seminar—3 hours. 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. Fetzer

Seminar—3 hours. 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. 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) II. Menges

Seminar—3 hours. 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) II. The Staff

Seminar—3 hours, written report. The course will be concerned with various special topics in German Literature, which may cut across the more usual period and genre rubrics. May be repeated for credit: actual content will vary from year to year.

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)

Discussion; directed reading. (S/U grading only.)

Professional Courses

390A. The Teaching of German (1) I. Estabrook

Lecture—1 hour. Prerequisite: graduate standing or consent of instructor. Theoretical instruction in modern teaching methods and demonstration of their practical application. Intended primarily for graduate teaching assistants. (S/U grading only.)

390B. The Teaching of German (1) II. Estabrook

Lecture—1 hour. Prerequisite: graduate standing or consent of instructor. Theoretical instruction in modern teaching methods and demonstration of their practical application. Intended primarily for graduate teaching assistants. (S/U grading only.)

390C. Practical Phonetics of German (1) III. Benware

Discussion—1 hour. An introduction to the sounds and sound patterns of modern German with laboratory exercises. (S/U grading only.)

400. Tutorial and Instructional Internship (3) I, II, III. The Staff (Chairperson in charge)

Lecture—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)

Rollie E. Poppino, Ph.D., Chairperson of the Department

Department Office, 176 Voorhies Hall (752-0776)

Faculty

Luis L. Arroyo, Ph.D., Assistant Professor
 ²Arnold J. Bauer, Ph.D., Professor
 William M. Bowsky, Ph.D., Professor
 ²Cynthia L. Brantley, Ph.D., Associate Professor
 David Brody, Ph.D., Professor
 ¹Daniel R. Brower, Jr., Ph.D., Professor
 Daniel H. Calhoun, Ph.D., Professor
 ²Robert O. Crummey, Ph.D., Professor
 Manfred P. Fleischer, Ph.D., Professor
 ²Paul Goodman, Ph.D., Professor
 ¹William W. Hagen, Ph.D., Associate Professor
 W. Turrentine Jackson, Ph.D., Professor
 David L. Jacobson, Ph.D., Professor
 Earl H. Kinmonth, Ph.D., Assistant Professor
 Norma B. Landau, Ph.D., Assistant Professor
 Kwang-Ching Liu, Ph.D., Professor
 Jung-Pang Lo, Ph.D., Professor Emeritus
 Eugene Lunn, Ph.D., Associate Professor
 ²C. Roland Marchand, Ph.D., Professor
 ¹Ted W. Margadant, Ph.D., Associate Professor
 Robert G. Moeller, M.A., Visiting Lecturer
 Rollie E. Poppino, Ph.D., Professor
 Don C. Price, Ph.D., Associate Professor
 ⁴Ruth E. Rosen, Ph.D., Assistant Professor
 Richard N. Schwab, Ph.D., Professor
 Morgan B. Sherwood, Ph.D., Professor
 James H. Shideler, Ph.D., Professor
 ⁴Wilson Smith, Ph.D., Professor
 Stylianos Spyridakis, Ph.D., Professor
 ⁵Donald C. Swain, Ph.D., Professor
 Joe W. Trotter, Jr., M.A., Acting Assistant Professor
 F. Roy Willis, Ph.D., Professor
 Walter L. Woodfill, Ph.D., Professor Emeritus

The Major Program

This 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 Department offers a variety of approaches to history, each emphasizing basic disciplinary skills: weighing evidence, analyzing historical problems, and presenting conclusions with clarity and logic. The Department thus can give basic support to the education of all undergraduates, whatever their major.

History is also a practical major if one is considering 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 student electing a major in History may complete Plan I, Plan II, or Plan III. *Plan I* enables students to concentrate chiefly on 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. The purpose of *Plan III* is to enable students to study in depth the field of twentieth-century history, whose common problems of political conflict, social development, and cultural creativity cut across the several geographical fields of concentration which the department now offers.

History

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter (Plans I, II, and III)	20
Five lower division courses, including at least two from each of two of the following fields	20
a. Western Civilization: History 4A, 4B, 4C, 1, 2, 3, 10, 30	10
b. Asian Civilization: History 9A, 9B	10
c. United States and Latin America: History 7, 17A, 17B, 22, 27A, 27B, 72A, 72B, 78A, 78B	10
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), 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
History 102 in field of concentration	5
History 103 in field of concentration	4
Total Units for the Major, Plan II	62

Depth Subject Matter—Plan III	41
History 146A, 146B, 174A, 174B	16
At least three upper division courses chosen from the following list of twentieth-century courses, classified by area of concentration. At least one course must be from category A.	12
A. Asia and Latin America: 161B, 163B, 165, 166B, 168, 192C, 193, 194C, 195	
B. United States: 169B, 172, 174C, 175C, 176B, 176C, 177, 179, 180C, 185B, 188B, 189C	
C. Europe: 137C, 141, 143C, 144C, 147B, 147C, 151D	
History 102, on a topic in twentieth-century history (normally chosen from sections E, F, H, I, J, M, N, or O)	5
Two additional upper division history courses selected from courses within a single field of study (e.g., Europe, United States, Africa, Latin America, Asia) which does not cover twentieth-century history	8
Total Units for the Major, Plan III	61

Fields of Concentration*

- European: History 102A, 102B, 102C, 102D, 102E, 102F, 102I, 102P, 111A, 111B, 111C, 121A, 121B, 121C, 130A, 130B, 130C, 131A, 131B, 131C, 133, 134A, 134B, 137A, 137B, 137C, 138, 141, 143A, 143B, 144A, 144B, 144C, 145, 146A, 146B, 147A, 147B, 147C, 148, 151A, 151B, 151C, 151D, 154.
- United States: History 102K, 102L, 102M, 170A, 170B, 170C, 171A, 171B, 171C, 173, 174A, 174B, 174C, 175A, 175B, 175C, 176A, 176B, 176C, 177, 178, 179, 180A, 180B, 180C, 183A, 183B, 185A, 185B, 187, 188A, 188B, 189A, 189B, 189C.
- East Asia: History 102G, 102H, 102N, 191A, 191B, 192A, 192B, 192C, 193, 194A, 194B, 194C, 194D, 195.
- Africa: History 102O, 115A, 115B, 115C, 116.
- Latin America: History 102J, 161A, 161B, 162, 163A, 163B, 165, 166A, 166B, 168, 169A, 169B.
- 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.

Recommended

Completion of all three courses in Western Civilization (i.e., History 4A, 4B, 4C) and one or two courses (normally a two-quarter sequence) in one of the following fields: Asian American studies, classics, cultural anthropology, cultural geography, principles of economics, English literature, literature of the United States, philosophy, political science, psychology, sociology, or statistics.

Major Advisers. L.L. Arroyo, W.M. Bowsky, D.H. Calhoun, M.P. Fleischer, W.T. Jackson, D.L. Jacobson, E.H. Kinmonth, N.B. Landau, D.C. Price, R.E. Rosen, R.N. Schwab, M.B. Sherwood, J.H. Shideler, 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. One course for the minor in history may be taken on a passed/not passed basis.

History	20
At least 20 units of upper division history courses	20
Examples of minor with thematic emphasis:	
a. Pre-Law (British and American Political and Constitutional Development) — twenty units chosen from History 151A, 151B, 151C, 170B, 180A, 180B, 180C, 102I or 102L (with approval of adviser).	
b. The Twentieth Century — twenty units selected from History 146A, 146B, 174A, 174B (at least 8 of the units); 102E, 102F, 102H, 102I, 102J, 102M, 102N, or 102O; 116; 137C, 141, 143C, 144C, 147B, 147C, 151D; 161B, 163B, 165, 166B, 168; 169B, 172, 174C, 175C, 176B, 176C, 177, 179, 180C, 185B, 188B, 189C; 192C, 193, 194C, 195.	
c. The History of Ideas in Society — twenty units selected from History 101, 102A-P (with approval of adviser), 130A, 130B, 130C, 133, 134A, 134B, 147A, 147B, 147C, 175A, 175B, 175C, 177, 179, 185A, 185B, 191A, 191B, 194B.	

Minor Advisers. Same as for major advisers.

Honors and Honors Program. A student may become eligible for graduation with highest honors by meeting the minimum grade-point average required by the College of Letters and Science and by demonstrating unusually imaginative or creative work in history. Such creative work may be demonstrated in various ways: in undergraduate seminars, in independent study, in special projects, or by distinguished work in Plan II of the major program. Departmental recommendation, based on clear evidence of distinction and originality, is a prerequisite for the awarding of highest honors.

Teaching Credential Subject Representative. D. L. Jacobson. See page 105 for 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 consists of 45 course units, including courses 17A and 17B, two lower-division courses in Western Civilization (1, 3, 4A, 4B, 4C) of which one must be 3 or 4C, one undergraduate seminar (course 101 or 102), and six additional courses, of which four must be at the upper division level. Successful completion of this program will allow the student to receive a waiver from examinations for the History Single-Subject Teaching Credential.

Graduate Study. The Department of History offers programs of study and research leading to the M.A., M.A.T., 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, D. Brody, K.C. Liu, E. Lunn, W. Smith, F.R. Willis.

American History and Institutions. This University requirement can be satisfied by passing any one of the following courses in History: 17A, 17B, 27A, 27B, 72A, 72B, 78A, 78B, 170A, 170B, 170C, 171A, 171B, 171C, 174A, 174B, 175A, 175B, 175C, 176A, 176B, 177, 179, 180A, 180B, 183A, 183B. The upper division courses may be used only with the consent of the instructor. (See also page 61.)

Courses in History**Lower Division Courses**

1. The Bible and Ancient History (4) I, III. Schwab
Lecture—3 hours; discussion—1 hour. An examination of Judaeo-Christian tradition as it met ancient Near Eastern

and classical ideas and institutions through New Testament times. Emphasis on the Bible as a historical document and on historical-critical interpretation of scriptures.

2. Ancient Civilizations (4) III. Fleischer
Lecture—3 hours; discussion—1 hour. The growth of ancient civilizations from the Sumerians to the Fall of the Roman Empire.

3. Cities: A Survey of Western Civilization (4) II. Willis
Lecture—3 hours; discussion—1 hour. A survey of western civilization focusing on ten cities, each at the height of its creativity: Athens, Rome, Constantinople, Paris, Florence, Amsterdam, Vienna, London, Moscow, and New York. Slides, music, and literature including political theory. Readings in original sources.

4A. History of Western Civilization (4) I, II. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. The growth of western civilization from late antiquity to the Renaissance.

4B. History of Western Civilization (4) II, III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Development of western civilization from the Renaissance to the Eighteenth Century.

4C. History of Western Civilization (4) I, III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. The development of Western Civilization from the Eighteenth Century to the present.

7. Latin American Civilization (4) III. Bauer
Lecture—3 hours; discussion—1 hour. An introduction to Latin America from the Mayas, Incas and Aztecs to the present. The course presents a micro-cosmic picture of a single individual (ranging from an Aztec peasant to Eva Peron) each week drawn from documentary and photographic evidence. Supplementary sessions explain the individual's social context and significance.

9A. History of East Asian Civilization (4) I, Liu
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.

9B. History of East Asian Civilization (4) II. Kinmonth
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 Leaders: An Introduction to the Twentieth Century** (4) III. Brower
Lecture—3 hours; discussion—1 hour. Twentieth-century history through biography (Wilson, Lenin, Hitler, Roosevelt, Stalin, Mao, Nehru, Castro and others).

15. Introduction to African History (4) I, ————; III, Brantley.
Lecture—3 hours; term paper. An examination of the long-range historical context as background to current conditions in Africa. This survey includes the early development of African civilizations through the twentieth-century colonization by Europeans.

17A. History of the United States (4) I, II. The Staff
Lecture—3 hours; discussion—1 hour. The growth of the American people from colonial times through the Civil War.

17B. History of the United States (4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. The American people from Reconstruction to the present.

***18. Introduction to United States History Through Film** (4) I, Goodman
Lecture-discussion—4 hours; use of films. An introduction to American history using approximately nine films with parallel readings on selected themes, such as the American Indian, the Civil War, the Great Depression, the cult of success. Topics and films may vary.

***22. Violence and Law in America** (4) III. Calhoun
Lecture—2 hours; discussion—2 hours. Movements of protest or social control from the revolutionary period to the present.

27A. Afro-American History (4) II. Trotter
Lecture—3 hours; discussion—1 hour. The history of black people in the United States from the African background to Reconstruction.

27B. Afro-American History (4) III. Trotter
Lecture—3 hours; discussion—1 hour. The history of black people in the United States from Reconstruction to the present.

30. Russian Cultural History (4) II. Crumme
Lecture—3 hours; written reports. A survey of Russia's history over the last thousand years as reflected in the lives of

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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.

***61. Discovery and Settlement of Spanish America** (4) II, Poppino
Seminar—4 hours. Some knowledge of Spanish recommended. Examination of the laws, customs, and activities of pre-Columbian and colonial Spanish-American society through reading and discussion of contemporary letters, reports, and other sources in transcription or translation. Each student to keep a journal of his studies. No final examination. Limited enrollment.

63. Introduction to Brazilian History (4) I, Poppino
Lecture—1 hour; seminar—3 hours. Reading of basic documents in English translation and extensive use of slides. Emphasis is on nineteenth-century slavery, race relations and economic development.

72A. Social History of American Women and the Family (4) I, Rosen
Lecture—3 hours; discussion—1 hour. The 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.

72B. Social History of American Women and the Family (4) II, Rosen
Lecture—3 hours; discussion—1 hour. The 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.

***78A. Great Issues in American History** (4) I, Jackson
Lecture—3 hours; discussion—1 hour. Discussion of historians' views of the nation's past, focusing upon the conflict of interpretation about key periods and events up to 1865.

***78B. Great Issues in American History** (4) II, Jackson
Lecture—3 hours; discussion—1 hour. Discussion of historians' views of the nation's past, focusing upon the conflict of interpretation about key periods and events since 1865.

***85. Nature, Man and the Machine in America** (4) I, Sherwood
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.

***90A. Modernization of China** (4) III, Liu
Lecture-discussion—4 hours; written reports. Reading and discussion of aspects of modern China. Background on the contemporary scene is stressed.

90B. Modernization of Japan (4) III, Kinmonth
Lecture-discussion—4 hours; written reports. Reading and discussion of aspects of modern Japan. Background on the contemporary scene is stressed.

95. Proseminar in Historical Study (4) III, The Staff (Chairperson in charge)
Discussion—3 hours; written reports. Prerequisite: consent of instructor. Open primarily for lower division students who have completed at least one course in Western Civilization or American History. Proseminar on selected topics in European or U.S. history, depending on the instructor. Designed for freshmen and sophomores. Intensive reading, discussion and writing.

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

101. Introduction to Historical Thought and Writing (5) III, Landau
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-P. 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. May be repeated for credit. Limited enrollment.

103. Topics in Historical Research (4) I, II, III, The Staff (Chairperson in charge)
Discussion—3 hours; individual consultation with instructor; 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.

111A. Ancient History (4) I, Spyridakis
Lecture—3 hours; discussion or paper (student option). History of ancient empires of Near East and of their historical legacy to Western world.

111B. Ancient History (4) II, Spyridakis
Lecture—3 hours; discussion or paper (student option). Political, cultural and intellectual study of Greek world from Minoan-Mycenaean period to end of Hellenistic Age.

111C. Ancient History (4) III, 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) I.
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. An 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 Anthropology 139B (fall), History 115B (winter) and Political Science 138 (spring).

***115C. History of Southern Africa, Swaziland, Lesotho, and Botswana from 1500 to the present** (4) I, Brantley
Lecture—3 hours; written reports. Prerequisite: courses 115A and 115B recommended. An introductory survey of the history of Southern Africa, including South Africa, Swaziland, Lesotho, and Botswana from 1500 to present.

***116. African History: Special Themes** (4) III, Brantley
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) I, Bowsky
Lecture-discussion and panel presentations—3 hours. European history from "the fall of the Roman Empire" to the eighth century.

***121B. Medieval History** (4) II, Bowsky
Lecture-discussion and panel presentations—3 hours. European history from Charlemagne to the twelfth century.

121C. Medieval History (4) I, Bowsky
Lecture-discussion and panel presentations—3 hours. European history from the Crusades to the Renaissance.

***130A. Christianity and Culture in Europe: 50-1450** (4) I, Fleischer
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, Fleischer
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) III, Fleischer
Lecture—3 hours; written report or research paper. A survey of the intellectual, cultural and political re-orientation 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) I, Fleischer
Lecture—3 hours. Prerequisite: courses 4A, 4B recommended. Western European history from about 1350 to about 1500.

131B. Early Modern European History (4) II, Fleischer
Lecture—3 hours. Prerequisite: courses 4A, 4B, 131A recommended. Western European history from about 1500 to about 1650.

131C. Early Modern European History (4) III, Fleischer
Lecture—3 hours. Prerequisite: courses 4A, 4B, 131B recommended. Western European history from about 1650 to about 1789.

133. The Age of Ideas (4) II, Schwab
Lecture—3 hours. The Enlightenment and its background in the seventeenth century.

134A. The Age of Revolution (4) III, Schwab
Lecture—3 hours. Ideas and institutions during the French Revolution and the Napoleonic era.

***134B. The Age of Revolution** (4) III, Schwab
Lecture—3 hours. Ideas and revolution after 1815. Offered in odd-numbered years.

***137A. Russian History: Kievan, Muscovite, and Petrine** (4) I, Crumme
Lecture—3 hours; discussion—1 hour. 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, Crumme
Lecture—3 hours; discussion—1 hour. 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, Crumme
Lecture—3 hours; written reports. The evolution of the Russian state and society from the collapse of tsarist Russia through the creation and consolidation of the new Soviet order.

***138. Selected Themes in Russian History** (4) II, Brower
Lecture—3 hours; written and/or oral reports. Thematic treatment of a particular major issue in Russian history, such as religion and culture in pre-modern Russia, autocracy, aristocracy, the arts, radicals and the revolution, from the period of Ivan the Terrible to Stalin.

***141. France Since 1615** (4) I, Margadant
Lecture—3 hours; term paper.

***143A. The Social and Cultural Traditions of Eastern Europe** (4) I, Hagen
Lecture—3 hours; term paper. Baltic, Danubian, Balkan lands. Crystallization of medieval cultures; aristocratic and peasant life (fifteenth to eighteenth centuries); Christians, Jews, Moslems—religious communities, social roles, political mentalities; eastern Europe's confrontation with the western Enlightenment (seventeenth and eighteenth centuries).

***143B. Eastern Europe: National Revivals, Imperial Decline 1789-1918** (4) II, Hagen
Lecture—3 hours; term paper. Social and political movements among the subject nationalities of the Hapsburg and Ottoman Empires and in the Polish and western lands of Russia; Imperial ruling institutions, socioeconomic developments, nationality policies; nationalist revolutions, secessionist wars, World War I and Imperial collapse.

***143C. Eastern Europe since 1918: Social and Political Revolution** (4) II, Hagen
Lecture—3 hours; term paper. Democracy and capitalism, conservative authoritarianism and popular radicalism in interwar eastern Europe; World War II and the creation of the Popular Democracies; political and social dynamics, Marxism and social thought, popular culture and political dissent since 1953.

***144B. The Emergence of Modern Germany 1648-1890** (4) II, Hagen
Lecture—3 hours; term paper. German society, politics and civilization in the eras of absolutism and the Enlightenment, revolutionary crisis (1789-1848), and industrialization and national unification (1848-1890).

144C. The Crisis of Modern Germany 1890-1945 (4) II, Moeller
Lecture—3 hours; term paper. The rise of German National Socialism amid the social, political and cultural conflicts of Imperial Germany and the Weimar Republic (1890-1933); the German people and the National Socialist dictatorship; National Socialist war aims and military defeat 1939-1945.

145. War and Revolution in Europe, 1789-1916 (4) III, Moeller
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) III, Willis
Lecture—3 hours; term paper. Survey of the history of Europe since 1939.

147A. European Intellectual History, 1800-1870 (4) I, Lunn
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.

147B. European Intellectual History, 1870-1920 (4) II. Lunn
Lecture—3 hours; term paper. The cultural and intellectual watershed of the late nineteenth and early twentieth centuries. The emergence of modern art and literature; psychoanalysis and the new social sciences. Focus on the work of Baudelaire, Wagner, Nietzsche, Freud, Weber and Kafka.

147C. European Intellectual History, 1920-1970 (4) III. Lunn
Lecture—3 hours; term paper. European thought and culture since World War I. The impact of Communism and Fascism; Existentialism; new currents since the late 1950's. Focus on the work of Lenin, Brecht, Hitler, Sartre, Camus, and Marcuse.

***148. From Cradle to Coffin: The Life Cycle in Nineteenth-Century Europe** (4) II. Margadant
Lecture—3; term paper. The family lives and work experiences of Europeans in the age of the Industrial Revolution (1750-1900). Compares the childhood, adolescence, courtship and marriage, work patterns, leisure activities, and old age of workers, peasants and the middle classes.

151A. England: The Middle Ages (4) I, Woodfill
Lecture—3 hours; term paper. Prerequisite: course 4A recommended. Origins of England to the accession of the Lancastrians. Survey includes: the 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) II. Woodfill
Lecture—3 hours; term paper. Prerequisite: courses 4A, 4B; 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. This course will examine 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.

154. Tudor and Stuart England (5) III. Woodfill
Seminar—3 hours; reports and research paper. Prerequisite: courses 151A, 151B and/or consent of instructor. Intensive investigation of selected aspects of Tudor and Stuart history; emphasis on social problems and the arts and learning.

161A. Latin American History (4) I.
Lecture-discussion—3 hours; written reports. Pre-Columbian civilization 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.

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. Bauer
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) I, Poppino
Lecture—3 hours; written reports. The history of colonial and imperial Brazil from 1500 to 1889. Offered in odd-numbered years.

***163B. History of Brazil** (4) I, Poppino
Lecture—3 hours; written reports. The history of the Brazilian republic from 1889 to the present. Offered in even-numbered years.

165. Latin American Social Revolutions (4) III. Poppino
Lecture—3 hours; written reports. Major social upheavals since 1900 in Mexico, Argentina, Brazil, Bolivia, and Cuba, examined as to similarities and differences in causes, course, and consequences.

166A. History of Mexico to 1848 (4) I, Arroyo
Lecture-discussion—3 hours; written and/or oral reports.

The political, economic, and social development of pre-Columbian, colonial and national Mexico to 1848. Offered in odd-numbered years.

166B. History of Mexico Since 1848 (4) II. Arroyo
Lecture-discussion—3 hours; written and/or oral reports. The history of Mexico from 1848 to the present. Offered in even-numbered years.

168. History of Inter-American Relations (4) II. Poppino
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) I, Arroyo
Lecture-discussion—3 hours; written and/or oral reports—1 hour. The economic, social, religious, cultural and political development of the Spanish-speaking population of the Southwestern United States from about 1800 to 1910.

169B. Mexican-American History (4) II. Arroyo
Lecture-discussion—3 hours; written and/or oral reports—1 hour. The role of the Mexican and Mexican-American or Chicano in the economy, politics, religion, culture and society of the Southwestern United States since 1910.

170A. Colonial America (4) I, Jacobson
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) II. Jacobson
Lecture—3 hours; term paper. An 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. Jacobson
Lecture—3 hours. The 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) I, Calhoun
Lecture—3 hours. The 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) II. Calhoun
Lecture—2 hours; discussion—1 hour; 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).

171C. The Emergence of Modern America (4) III. Brody
Lecture—3 hours. From Reconstruction to the twentieth century, including political and intellectual change, the advent of big business, the rise of organized labor, ethnic adjustments, urbanization, and movements of social unrest.

***172. History of the South, 1880-1976** (4) III.
Lecture—3 hours; term paper. The history of the South from a regional perspective. Topics include: the Confederate legacy; southern industrial growth, the tenant-sharecropping systems; white social and political supremacy; the southern demagogues; the Freedom Bus rides; the 1970's political re-emergence.

173. U.S. Military and Naval History: the Nineteenth Century (4) III. Calhoun
Lecture—2 hours; discussion—1 hour; schedule research-paper consultation. Evolution of techniques and organizations. Major campaigns of the War of 1812, the Mexican War, and the Civil War.

174A. Recent History of the United States (4) I, Shideler
Lecture—3 hours; discussion—1 hour. Study of political, economic, and cultural aspects of American democracy from 1900 to the 1930s.

174B. Recent History of the United States (4) III. Marchand
Lecture—3 hours; discussion—1 hour. Study of political economic, and cultural aspects of American democracy from the 1930s to the present.

***174C. Selected Themes in Twentieth-Century American History** (4) I, III.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 174A or 174B, or consent of instructor. Selected topical themes of the period from the 1890s to the present. Emphasis will be on analysis, synthesis and interpretive overview rather than a chronological narrative of events.

***175A. Intellectual History of the United States** (4) II. Smith
Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: course 17A or the equivalent; or 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.

***175B. Intellectual History of the United States** (4) III. Smith
Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: courses 17A and 17B or the equivalent; or 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) II. Smith
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. Social and Cultural History of the United States (4) II. Marchand
Lecture-discussion—3 hours; term paper. Study of social and cultural forces in American society from colonial times through the Civil War with emphasis on social structure, immigration and nativism, racial and occupational groups, social reform movements and changes in social values.

***176B. Social and Cultural History of the United States** (4) III. Rosen
Lecture-discussion—3 hours; term paper and written or oral report. Study of social and cultural forces in American society since the Civil War with emphasis on social structure, immigration, urbanization, labor organizations, racial and national groups, social reform movements and changes in social values.

***176C. Social and Cultural History of the United States** (4) III. Rosen
Lecture-discussion—3 hours; written and/or oral reports. Prerequisite: course 176A or 176B or consent of instructor. Theories of class structure and "mass" culture in U.S. with attention to several selected topics for the quarter, including such topics as popular religious movements, attitudes toward work and leisure, popular recreation, advertising and mass media, popular literature and class subcultures.

177. Black History Since 1900 (4) III. Trotter
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 17A, 17B, 27A, 27B strongly recommended. Examination of the political, economic, social, and intellectual history of black people in the United States from 1900 to the present.

***178. American Colleges and Universities** (4) III. Smith
Lecture—3 hours; term paper. A survey of American higher learning from colonial Harvard to the present, emphasizing institutional intellectual life and the role of colleges and universities in their larger society. Tutored term paper; readings of general interest. Offered in even-numbered years.

179. The Working Class in American Society (4) I, Brody
Lecture—3 hours; written reports. Prerequisite: course 17B recommended. American labor from the mid-nineteenth century to the present. Social, economic and political forces. Trade unionism and radical movements. Offered in even-numbered years.

***180A. Growth of American Politics to 1815** (4) I, Goodman
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) II. Goodman
Lecture—3 hours; extensive reading and supervised writing. Continuation of course 180A.

180C. Growth of American Politics, 1890 to the Present (4) III. Goodman
Lecture—3 hours; extensive reading and supervised writing. Continuation of course 180B.

183A. The Frontier Experience: Trans-Mississippi West (4) I, Jackson
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. Jackson
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.

History

185A. History of Science in America (4) II. Sherwood
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) III. Sherwood
Lecture—3 hours; research paper. Study of American technology, emphasizing biographical approach to an historical understanding of technological change, creative processes, institutions, ideas, and relationships between technology and society from colonial times to present.

***187. Issues in American Educational History** (4) III. Calhoun
Lecture—3 hours; discussion—1 hour. Exploration of the patterns by which educational institutions have developed, with emphasis on the ways in which Americans have used the transmission of culture between generations as a focus for general social criticism. Offered in odd-numbered years.

188A. History of Agriculture in the United States (4) II. Shideler
Lecture—3 hours; discussion—1 hour. Prerequisite: junior or senior standing. History of agricultural development to 1900 with emphasis on social and economic institutions.

188B. History of Agriculture in the United States (4) III. Shideler
Lecture—3 hours; discussion—1 hour. Prerequisite: junior or senior standing. History of agricultural changes from 1900 to the present with emphasis on the background and evolution of government policy.

189A. History of California (4) I. Jackson
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) II. Jackson
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) III. Jackson
Lecture—3 hours; written and/or oral reports. Impact of World War I; conservative reaction of the 1920's; rise of organized labor; the automobile and moving picture industry; New Deal developments; changes with World War II; role of minorities; contemporary politics.

191A. Classical China (4) II. Price
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) III. Price
Lecture—3 hours; term paper. Political disunion and the influx of Buddhism; reunification under the great dynasties of Tang, Sung, and Ming with analysis of society, culture and thought.

192A. Late Imperial China: Background to Revolution (4) II. Liu
Lecture—2 hours; discussion—1 hour; term paper. Patterns and problems of Chinese life traced through the Ming and Ch'ing dynasties. Readings include literary materials in English translation (particularly novels) which reflect the social and intellectual scene, the elite ethos as well as popular culture. Offered in even-numbered years.

192B. Late Imperial China: Background to Revolution (4) III. Liu
Lecture—2 hours; discussion—1 hour; term paper. Internal and external pressures in China from the early nineteenth through the early twentieth century. Emphasis on the impact of the West and the beginnings of revolutionary change. Offered in odd-numbered years.

192C. The Chinese Revolution (4) I. Price
Lecture—3 hours; 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.

***193. History of the People's Republic of China, 1949 to the Present** (4) II. Liu
Lecture—2 hours; discussion—1 hour; term paper. A 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 even-numbered years.

***194A. Aristocratic and Feudal Japan** (4) II. Kinmonth
Lecture—3 hours; term paper and/or discussion. A 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 odd-numbered years.

194B. Early Modern Japan (4) III. Kinmonth
Lecture—3 hours; term paper and/or discussion. A 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) I. Kinmonth
Lecture—3 hours; term paper and/or discussion. A 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. Topics in Japanese Social and Economic History** (4) III. Kinmonth
Lecture—3 hours; term paper and discussion. A thematic treatment of major aspects of Japanese history in comparative perspective. Each year one of the following areas will be emphasized: business and labor, women and the family, or technology and education. May be repeated for credit.

***195. Modern China and the West** (4) I. Liu
Lecture—2 hours; discussion—1 hour; term paper. A history of European and American relations with China, political, cultural and economic, in the context of East Asian international relations and emphasizing the twentieth century. Offered in odd-numbered years.

196. Internship in History (2-5) 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.)

197T. Tutoring in History (2) I, II, III. 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-O. Sources and General Literature of History (4) I, II, III. The Staff
Seminar—3 hours. Designed primarily for students preparing for higher degrees in 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.

202. Social Science in Historical Practice (4) III. The Staff
Seminar—4 hours. Explores sociological and economic ideas that have actually been used by working historians, especially in United States history, and develops ways to evaluate and plan such efforts.

203. Seminar Research (4) I, II, III. 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) II. The Staff (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) I. 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.

204C. Thematic Seminar (4) III. The Staff (Chairperson in charge)
Seminar—3 hours; research paper. Prerequisite: consent of instructor for non-History graduate students. Interdisciplinary seminar emphasizing socioeconomic, political and intellectual themes. May be repeated for credit.

***211. Ancient History** (4) I, II.
Seminar—3 hours. Prerequisite: courses 111A, 111B, 111C. A seminar dealing with the various aspects of Near Eastern and Greco-Roman civilization.

***221. Medieval History** (4) I, II. Bowsky
Seminar—3 hours. Prerequisite: courses 121A, 121B, 121C recommended. Topics in the history of medieval and early Renaissance Europe.

***237. Russian History** (4) I.
Seminar—3 hours. Prerequisite: a reading knowledge of Russian. Topics relating to the history of Muscovite and Imperial Russia before 1856.

***242. History of the Enlightenment** (4) III. Schwab
Seminar—3 hours. Prerequisite: a reading knowledge of French. Intellectual and social history of Europe during the Enlightenment. May be repeated for credit.

***245. Modern European History** (4) II. Hagen, 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.

***246. Europe in the Twentieth Century** (4) II. Willis
Seminar—3 hours. Political history of Europe since 1919, with particular emphasis on the post 1939 period.

***251A-251B. English History** (4-4) II-III. Woodfill
Seminar—3 hours. Prerequisite: courses 151A, 151B, 151C, 154 recommended. (Deferred grading only, pending completion of sequence.)

***261. Latin American History** (4) I, II, III. Bauer, Poppino
Seminar—3 hours. Prerequisite: two courses in Latin American history; reading knowledge of Spanish or Portuguese.

***270. Early American History** (4) III. Jacobson
Seminar—3 hours.

***271. History of the United States, 1760-1815** (4) II. Goodman
Seminar—3 hours.

***272. History of the United States, 1815-1848** (4) I, Calhoun
Seminar—3 hours.

***273A-273B. Research Seminar in the Comparative History of Women and the Family** (4-4) I-II. Rosen
Seminar—3-3 hours. 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.)

***274. Recent History of the United States** (4) I.
Seminar—3 hours. Topics in twentieth century American history.

275. American Social and Intellectual History (4) I, Smith
Seminar—3 hours. Prerequisite: courses 175A, 175B and 175C or the equivalent; or consent of instructor. Studies in the recent historiography of, or research and writing in, American social and intellectual history. May be repeated for credit.

276. Social History of Science and Technology in America (4) I, Sherwood
Seminar—3 hours. Prerequisite: graduate standing. Studies in the historiography of, and research in, the history of science and technology in America from colonial times to the present.

279. History of the United States: the Twentieth Century (4) II. Brody
Seminar—3 hours. Emphasis on social and economic developments.

***283. History of the United States: The Frontier** (4) III. Jackson
Seminar—3 hours.

***288. History of the United States** (4) II. Shideler
Seminar—3 hours. Prerequisite: graduate standing. Emphasis on agricultural history and closely related topics such as exports, transportation and politics.

291A-291B. Chinese History (4-4) I-II. Price
Seminar—3 hours. Prerequisite: consent of instructor. Research on topics to be chosen by the students for the purpose of writing article-length papers.

***291C. Chinese History** (4) III. Price
Seminar—3 hours. Prerequisite: reading knowledge of Chinese. Readings in Chinese historical materials. Training in the techniques of using Chinese reference works will be provided.

- 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 Course

300. The Teaching of History in the Junior College and Secondary Schools (3) I.
Lecture—3 hours. Prerequisite: junior or senior standing with a teaching major or minor in social studies. Methods for the presentation of history at the secondary and junior college level.

Home Economics

(College of Agricultural and Environmental Sciences)

The Major Program

The Home Economics major, through the study of the humanities, the biological, physical and social sciences, and specialized subject matter, provides an excellent background for professional home economists. Employment opportunities exist in governmental, industrial, and community agencies dealing with social services, private industry, extension services, and teaching at the secondary and community college levels after completion of a one-year credential program. The major encompasses the broad field of family and consumer sciences combining laboratory work with academic theory in such areas as human (child) development, food science, nutrition, and textiles.

Graduates are qualified to enter graduate programs in Child Development and Textiles, or with additional courses in biological sciences, the program in Food Science or Nutrition.

This major also provides academic preparation for those who plan to pursue a teaching credential.

Home Economics

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. *Courses without parentheses are required.*)

	UNITS
Preparatory Subject Matter	55-57
Anthropology, cultural or general sociology (Anthropology 2, Sociology 3)	4
Biological science (Biological Sciences 1)	5
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
Economics (Economics 1A, 1B)	10
Physiology (Physiology 2, 110)	4-5
Psychology, general (Psychology 1)	4
Statistics (Statistics 13, Economics 12)	4-5
Written expression and oral expression (see College requirement, page 70)	8
Depth Subject Matter	53-57
Economics	12
Consumer Economics 141, 142;	
Consumer Science 140	14-15
Food and nutrition	14-15
Food Science and Technology 100A, 100B; Nutrition 101-102 or 110-111	14-15

Human development	8
Human Development 110 and 100A or 100B or 100C	8
Textiles and clothing	10
Textiles and Clothing 6, 7, 162	10
Plus, select one from the following specializations:	
(a) <i>Consumer affairs</i>	11
Agricultural Economics 112;	
Consumer Science 100;	
Rhetoric 140 or 141	11
(b) <i>Food and nutrition</i>	12
Food Science and Technology 101A, 101B; Nutrition 111L, 118, 120	12
(c) <i>Housing and environmental design</i>	12
Applied Behavioral Sciences 171; Design 21, 134	12
(d) <i>Human development</i>	9
Human Development 30A-30B, 100A, 100B, 100C, or 140;	
Biological Sciences 12	9
(e) <i>Textiles and clothing</i>	11
Textiles and Clothing 17A, 161 or 163, 161L or 162L or 163L, 172	11
Restricted Electives	31-37
Additional courses related to the major determined in consultation with adviser.	
Unrestricted Electives	35
Total Units for the Major	180

Major Adviser. M. A. Morris (*Textiles and Clothing*).

Graduate Study. See page 99.

Teaching Credential Subject Representative. See under the major in Agricultural Education (page 136).

Courses in Home Economics

Lower Division Courses

***90. Challenges and Opportunities in Home Economics** (1) III. Morris in charge
Seminar—1 hour. Specialists in selected areas of home economics address current issues facing today's professional including challenges, opportunities, and prospects for appropriately trained university graduates. May be repeated once for credit with consent of instructor. (P/NP grading only.) Offered in even-numbered years.

92. Internship in Home Economics (1-12) I, II, III. The Staff (Morris in charge)
Laboratory—3-36 hours. Work-learn experience off and on campus in a home economics related area. Internship supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

192. Internship in Home Economics (1-12) I, II, III. The Staff (Morris in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience off and on campus in a home economics related area. Internship supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Morris in charge)
Prerequisite: consent of instructor. Directed group study of selected topics in home economics (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Morris in charge)
Prerequisite: consent of instructor. Directed individual study for advanced undergraduate students. (P/NP grading only.)

Home Economics Education

See Agricultural and Home Economics Education

Human Development

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Applied Behavioral Sciences.

The Major Program

Human (Child) Development is an appropriate undergraduate major if you want to explore the developmental process in humans throughout the life cycle. Concentrating on the periods between birth and young adulthood, cognitive and personality/social development are studied from various perspectives. The emphasis is on the interrelationship of the development of the person, the family, and the community. It is an appropriate major for those planning to pursue advanced degrees in the behavioral sciences and offers course work useful for persons who will later pursue careers in education, child guidance, social welfare, health science related fields, or research in human development.

Human Development majors observe infants, children, and adults in a variety of situations. You may also participate in study projects with people from different socioeconomic and cultural backgrounds who function in a variety of institutional settings (schools, hospitals, mental health clinics, and group foster homes).

Students who anticipate exploring the biological aspects of Human Development should include in their preparatory course work the prerequisites for upper division biological sciences courses.

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
Preparatory Subject Matter	38-43
Anthropology 1 and 2	8
Biology (Biological Sciences 1 or 10)	4-5
Genetics (Genetics 10, 115, Psychology 151)	4-5
Nutrition 10 or 101	3-5
Physiology (Physiology 2, 10, 110)	4-5
Psychology 1 and 15	8
Statistics	4
Human Development 30A-30B	3
<i>Note: courses recommended are Biological Sciences 1, Genetics 115, and Physiology 110.</i>	
Depth Subject Matter	51-52
Human Development 100A, 100B, 100C, 110	16
Social-cultural processes (Human Development 102, 103)	4
Assessment (Human Development 120, 121)	4
Cognitive processes (Human Development 101, 132)	3-4
Exceptional children (Human Development 130, 131)	4
Practicum (Human Development 140A, 141, 142)	4
Additional upper division Human Development or related courses from list of restricted electives as determined in consultation with faculty adviser	16

NOTE: For key to footnote symbols, see page 130.

Human Development; Individual Major

Breadth Subject Matter 20
English or rhetoric, to include at least one upper division course, one course emphasizing expository skills (see College requirement, page 70) 12
American history or political science 8

Unrestricted Electives 65-71
Total Units for the Major 180

Major Adviser. D. B. Lynn.

Related Major Program. See the major in Applied Behavioral Sciences (page 146).

Graduate Study. See page 99.

Courses in Human Development

Questions pertaining to the following courses should be directed to the instructor or to the Department of Applied Behavioral Sciences, 119 AOB-4.

Lower Division Courses

30A-30B. Observational Techniques and Case Study of a Young Child (2-1) I-II; II-III; III-I. Welker
Lecture—2 hours; laboratory—2 hours (30A); seminar—1 hour (30B). Prerequisite: Psychology 1 and consent of instructor. Observational techniques. Intensive case study of an individual child aged 6 months to 5 years; analysis and use of observational data. (Deferred grading only, pending completion of sequence.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Pilisuk in charge)
(P/NP grading only.)

Upper Division Courses

100A. Infancy and Early Childhood (4) I, Harper; II, Lynn
Lecture—3 hours; discussion—1 hour; field observations of preschool children. Prerequisite: introductory psychology and biology. 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, Harper; III, Lynn
Lecture—4 hours; 3 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 (4) II, Kraft; III, Hawkes
Lecture—3 hours; discussion—1 hour. Prerequisite: introductory psychology. Biological, cognitive and social psychological aspects of adult development.

101. Cognitive Development (4) III. Kraft
Lecture—4 hours. Prerequisite: courses 100A-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. Bryant
Lecture—3 hours; discussion—1 hour. Prerequisite: introductory psychology; courses 100A-100B recommended. Theories of the development of a child's personality through his interactions with children and adults. Emphasis on development of interpersonal and culturally valued skills.

103. Cross-Cultural Study of Children (4) I, Werner
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) I, Crockenberg; III, Lynn
Lecture—3 hours; discussion—1 hour. Prerequisite: introductory psychology. Current and future factors influencing American families including changing sex roles, changing sexual mores, and parenthood.

120. Research Methods in Human Development (4) II. Harper
Lecture—2 hours; discussion—2 hours. Prerequisite: courses 100A-100B or the equivalent; elementary statistics. Research in selected areas of human development (i.e., infancy, learning, cognition, socialization, personality).

121. Psychological Assessment (4) I, II, III. Barton, Werner
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; III, Bachtold
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100A-100B or consent of instructor. Discussion of psychosis, neurosis, behavior disorders, and learning difficulties in children.

131. Developmental Disabilities (4) II, Werner; III, Barton
Lecture—4 hours. Prerequisite: course 100A or consent of instructor. Mental retardation and special learning disabilities, etiology, diagnosis, education and socialization. Introduction to community resources.

132. The Gifted (3) I, Bachtold
Lecture—3 hours. Prerequisite: courses 100A-100B or consent of instructor. Conceptualization, identification and education of the intellectually and creatively gifted individual.

140A. Laboratory in Early Childhood: Communication and Interaction (4) I, II, III. Welker
Lecture—2 hours; discussion—1 hour; laboratory—5 hours. Prerequisite: course 30A and consent of instructor; course 100A recommended. Communication and interaction modes with children six months to five years of age. Linkage of communication theory with behavior.

140B. Laboratory in Early Childhood: Child-Care Programs (4) I, II, III. The Staff (Welker in charge)
Lecture—2 hours; discussion—1 hour; laboratory—5 hours. Prerequisite: course 140A and consent of instructor. Interaction with children six months to five years of age in a preschool program. Linkage of child development theory with behavior. Sect. 1, infancy; Sect. 2, program planning and analysis. May be repeated for credit with a change in section.

141. Field Studies with Children and Adolescents (4-6) II, III. The Staff (Crockenberg in charge)
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, II, III. Bryant, Barton, Bachtold
Discussion—1½ 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.

150. Supervision and Administration of Early Childhood Education Programs (4) Summer. Welker
Lecture—40 hours total. Prerequisite: course 140A 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 odd-numbered years.

198. Directed Group Study (1-5) I, II, III. The Staff (Pilisuk in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Pilisuk in charge)
(P/NP grading only.)

Graduate Courses

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.

***213. Cross-Cultural Study of Children** (3) III. Werner
Seminar—3 hours. Prerequisite: graduate standing. Current theory and research concerned with ethnic and social class differences in children's development. Methods of cross-cultural research, patterns of child rearing, achievement motivation, cognitive and social development among children in the developing countries and ethnic subcultures in the U.S.A.

***214. Clinical Child Development** (3) II. Bryant
Seminar—3 hours. Prerequisite: consent of instructor. Clinical child development based on developmental-competency model rather than medical-psychopathology model. Theory and research focusing on acquisition of interpersonal skills (e.g., social sensitivity) and individual differences. Opportunities, environments, and relationships encouraging intra- and interpersonal growth and satisfaction emphasized.

***215. Social and Moral Development** (3) I, Crockenberg
Discussion—3 hours. Prerequisite: consent of instructor. Theories of social and moral development and related research. Emphasizes social learning and cognitive-developmental approaches to development of altruism, concern for others, resistance to temptation, social responsibility, control of aggression and moral judgment from infancy through adolescence.

221. Psychological Assessment of Children (4) III. Bachtold
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.

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.

***237. Parent-Child Interaction** (3) I, Lynn
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 odd-numbered years.

290. Seminar (3) I, Bachtold; II, Werner; III, Barton
Seminar—3 hours. Discussion and evaluation of theories, research, and issues in human development. Different topics each quarter.

298. Group Study (1-5) I, II, III. The Staff (Pilisuk in charge)

299. Research (1-12) I, II, III. The Staff (Pilisuk in charge)
(S/U grading only.)

Individual Major

(Colleges of Agricultural and Environmental Sciences, Engineering, 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 and provide, where appropriate, a basis for the applicant's career objectives as well as meet University and College academic standards.

Proposals for individual majors must be submitted *before the fourth quarter prior to graduation for students registered in the Colleges of Agricultural and Environmental Sciences and Letters and Science, and before the third quarter prior to graduation for students in the College of Engineering*. Specific requirements for each college are shown below. Application forms are available in program offices.

Individual Major: College of Agricultural and Environmental Sciences

(Academic Advising Center)
Program Office, 122 Hoagland Hall

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 Matter	45
An individualized program of 45 upper division units taken from two or more areas of study (at least one of the areas must be within the College). At least 30 of the 45 units must be taken from courses provided by the College.	
Unrestricted Electives	(variable)
Total Units for the Degree	180

Additional requirements

At least 54 of the 180 units needed for graduation must be upper division. The College also requires that at least 8 units must be in English and/or Rhetoric courses that emphasize written or oral expression (see page 70).

Major Adviser. The course of study must be developed in consultation with the Master Adviser, 122 Hoagland Hall, and two or more faculty members prior to final review by the Individual Major Committee for the College.

Students applying for an Individual Major will be admitted into the Exploratory Program.

Individual Major: College of Letters and Science

(Dean's Office)
Program Office, 150 Mrak Hall

Committee in Charge

- Dennis J. Dingemans, Ph.D. (*Geography*),
Committee Chairperson
- Joel E. Keizer, Ph.D. (*Chemistry*)
- Robert L. Rudd, Ph.D. (*Zoology*)
- T.Y. Shen, Ph.D. (*Economics*)
- Marian B. Ury, Ph.D. (*Comparative Literature*,
Religious Studies)

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 Matter	45-54
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.	
Total Units for Degree	180

Student Proposal

A student submits to the Dean's Office his or her 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.

NOTE: For key to footnote symbols, see page 130.

Honors Program. Toward the end of their junior year, students potentially eligible for highest honors at graduation (see page 97), 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 highest honors will be conditional upon both the maintenance of the required grade-point average and the completion of the senior thesis project. The Committee will consider alteration of the student's original major proposal to allow up to 3 units of independent study during each of the last two quarters of the senior year for work on senior honors thesis.

Individual Major: College of Engineering

(Undergraduate Office)
Program Office, 2132 Bainer Hall

B.S. Major Requirements:

Subject Areas	(minimum) UNITS
Mathematics (calculus, differential equations, vector analysis)	18
Physical and biological sciences (including at least 10 units of general chemistry and 12 units of physics for engineering and science students)	27
Analytic mechanics and strength of materials	6
Applied thermodynamics	3
Applied electricity and magnetism	5
Properties of materials	4
Engineering design (courses selected from a list developed for Individual Engineering Majors by the Undergraduate Study Committee)	5
Additional upper division engineering courses, exclusive of 199 courses	24
Written and oral expression (courses equivalent to English 1 and either Rhetoric 1 or 3)	8
Humanities-social sciences (from a list of courses and course groups approved by the Undergraduate Study Committee)	23
Additional units to complete 180-unit program (Unrestricted electives, 10 units maximum)	57
Total Units for the Degree	180

Student Proposal

To follow this alternative, your complete program of study and a statement of objectives must be received by the College Undergraduate Office prior to the official beginning date of the third quarter preceding graduation. It is to your advantage to submit your proposal well in advance of this deadline (during your junior year) so that any modifications required by the Committee can be made before the beginning of your senior year. Once your curriculum has been approved, changes may be made only for good cause and with the further approval of the Committee. Additional information may be obtained from the Engineering Undergraduate Office. (Also see pages 76-77.)

Integrated Studies

(College of Letters and Science)

Alan A. Stambusky, Ph.D., Program Director
Program Office, 4208 Storer Hall (752-1219)

Committee in Charge

- Arthur E. McGuinness, Ph.D. (*English*),
Committee Chairperson
- Robert S. Bloch, M.A. (*Music*)

- Robert M. Murphey, Ph.D. (*Psychology*)
- G. Thomas Sallee, Ph.D. (*Mathematics*)
- Alan A. Stambusky, Ph.D. (*Dramatic Art*)

Faculty

- ¹Daniel R. Brower, Jr., Ph.D., Professor (*History*)
- Richard T. Curley, Ph.D., Associate Professor (*Anthropology*)
- Gordon J. Edlin, Ph.D., Professor (*Genetics*)
- ^{2,3}Kenneth R. Greider, Ph.D., Professor (*Physics*)
- Nancy Lieber, Ph.D., Lecturer (*Integrated Studies*)
- ³David A. Robertson, Ph.D., Associate Professor (*English*)
- Alan A. Stambusky, Ph.D., Professor (*Dramatic Art*)

The Program of Study

Integrated Studies introduces students to a variety of disciplines in humanities, natural sciences, and social sciences, as these disciplines relate to a common historical period or a common theme. 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 offers an intelligent model for the fulfillment of the College breadth requirements as all of these courses count toward the completion of that requirement. Integrated Studies courses are open to all students but enrollments are limited in order to keep the class sizes small.

There is, in addition, a program for a limited number of freshmen who take four Integrated Studies courses during the year as well as the Integrated Studies Seminar each quarter, and who live in the Tercero dormitory complex. An Integrated Studies House, Building B, Tercero Hall, is the focal point for the freshman program activities.

Courses in Integrated Studies

Lower Division Courses

1A, 1B, 1C, 1D. Ideas and Issues in the Sciences (4) I, II, III. The Staff (McGuinness in charge)
Lecture—4 hours. Exploration of major developments in the natural sciences and social sciences. Emphasis on the interrelation of the sciences. Themes and fields vary from year to year. Theme for 1980-81: "tradition, revolution, and modern society." Fields selected for 1980-81 are: anthropology, genetics, physics, and political theory.

2A, 2B, 2C, 2D, 2E. Ideas and Issues in the Arts (4) I, II, III. The Staff (McGuinness in charge)
Lecture—4 hours. Exploration of major themes and/or major figures in the humanities. Emphasis on the interrelation of history and the arts. Themes and fields will vary from year to year. Theme for 1980-81: "tradition, revolution, and modern society." Fields selected for 1980-81 are: drama, history, literature, and theology.

8. Colloquium (1) I, II, III. The Staff (McGuinness in charge)
Discussion—1 hour. Lectures, films, film strips and readings on the arts and sciences. May be repeated for credit. (P/NP grading only.)

9. Seminar (1) I, II, III. The Staff (McGuinness in charge)
Conference—1 hour. Preparation of a research report. Normally to be taken with course 8. May be repeated for credit. (P/NP grading only.)

Internal Medicine

See Medicine

International Agricultural Development

(College of Agricultural and Environmental Sciences)

The Major Program

Today there is a need for trained individuals who can translate and apply recently developed agricultural knowledge and technology to problems of food production, nutrition, health, income generation, marketing, and asset redistribution in less developed nations. Students interested in contributing to the solution of these problems associated with world hunger and health, as well as growth with equity, may wish to investigate the major in International Agricultural Development. Courses in International Agricultural Development are taught by faculty with extensive experience in developing nations.

The International Agricultural Development major provides opportunities to develop competence in a technical field in agriculture or a social science specialization, and, in addition, to acquire those special qualities of mind and spirit requisite for effective performance in underdeveloped and developing areas of the world. For a career in International Agricultural Development, you must be perceptive, sensitive, tolerant and understanding, and possess knowledge of the social-political-economic-cultural relationships which characterize developing societies and economies. Graduates concerned with issues and problems in international development may find job opportunities in government service, in private voluntary organizations, with commercial and consultant firms, and in multinational development companies working overseas.

International 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
Preparatory Subject Matter	49-50
Social Sciences core	
Physical science (Chemistry 1A, 1B)	10
Mathematics (Mathematics 19, Agricultural Science and Management 150)	7
Biological sciences (Biological Sciences 1, Plant Science 2, Animal Science 1, Nutrition 10, Botany 2, Zoology 2)	12-13
English (see College requirement, page 70)	8
Social sciences (Applied Behavioral Sciences 19, Anthropology 2, Political Science 2, Sociology 1, History 4C)	12
Natural Sciences and Physical Sciences core	
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Physics (Physics 1A or 2A)	3
Mathematics (Mathematics 16A or 21A; Agricultural Science and Management 150)	7-8
Biological sciences (Biological Sciences 1, Botany 2, Plant Science 2, Animal Science 2, Zoology 2-2L, Bacteriology 2 and 3, Genetics 100A-100B or 120)	15
English (see College requirement, page 70)	8
Depth Subject Matter	42-44
International Agricultural Development 100A-100B, plus 101 or 102 or 141	8-10
International Agricultural Development 110A, 110B, 110C	9

International Agricultural Development 190 plus at least one course from 10, 101, 102, 141, 195, 199	7
Agricultural economics and economics, Economics 1A-1B and two upper division courses relevant to development (Economics 100, 110B, 115A, 115B, 116, 118, 119; Agricultural Economics 100A, 100B, 113 or 136, 114, or 157, 125, 140, 147, 148, 151, 155. For students who wish to emphasize statistical applications: Agricultural Economics 106A, 106B, or Agricultural Science and Management 150)	18
Primary Field of Specialization†	60
<i>Natural Sciences or Social Sciences:</i>	
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.	
<i>Natural Sciences:</i>	
Student should include some coursework in social sciences appropriate to the geographic area of personal interest (e.g., anthropology, geography, history or political science area studies courses).	
Unrestricted Electives	26-29
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 Major 180	

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. O.E. Thompson (*Applied Behavioral Sciences*).

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 Graduate Adviser.

Graduate Adviser. D.E. Hansen (*Agricultural Economics*).

Related Courses. See Agricultural Economics 125, 148, 215C; Agronomy 21, 111, 210; Animal Science 117; Anthropology 221; Economics 115A-115B, 118, 215A-215B-215C; Geography 142; Nutrition 20; Political Science 185; Sociology 144; Vegetable Crops 150.

Courses in International Agricultural Development

Questions pertaining to the following courses should be directed to the instructor or to the Department of Applied Behavioral Sciences, 119 AOB-4

Lower Division Courses

10. Population, Food, and Life; Quality or Subsistence? (3) II. Jolly (*Agricultural Economics*)
Lecture—3 hours. Food requirements versus self-realization as the limiting force in population growth; the interaction of changing human goals and new technology through successive stages in economic development; agriculture's contributions to development.

92. Internship (1-12) I, II, III. The Staff (Thompson in charge)
Field placement—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. Crop Production under Tropical Conditions (4) II. Mikelsen (*Agronomy*)
Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Science 2 or Botany 2. Climatic and soil adaptation; varieties and varietal improvement in annual and perennial crops; pests, diseases, and their control; fertilization and other management practices.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

102. Livestock and Poultry Production in Developing Areas (4) I, Vohra (*Avian Sciences*)
Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Ecological considerations of developing areas including feed resources, pests, diseases and their control; kinds of livestock, wild game, poultry and fish suited to these areas and their management; uses of animals and their by-products.

110A. Agricultural Development: Micro (3) I. Joy (*Applied Behavioral Sciences*)
Lecture—3 hours. Prerequisite: upper division standing and consent of instructor. The process of agricultural development and the role of analysis in its management. Focuses on the understanding of the behavior of farmers as members of communities.

110B. Agricultural Development: Regional (3) II. Joy (*Applied Behavioral Sciences*)
Lecture—3 hours. Prerequisite: course 110A. The process of agricultural development, and the role of analysis in its management. Focuses on project and regional level view.

110C. Agricultural Development: National and International (3) III. Joy (*Applied Behavioral Sciences*)
Lecture—3 hours. Prerequisite: course 110B. The process of agricultural development and the role of analysis in its management. Focuses on national and international level views.

141. Technology for Agriculture in Developing Regions (2) I, Chancellor (*Agricultural Engineering*)
Lecture—1 hour; laboratory-discussion—2 hours. Prerequisite: Physics 1A. 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 Agricultural Engineering Technology 141.)

190. Proseminar in International Agricultural Development (3) III. Thompson (*Applied Behavioral Sciences*)
Lecture—1 hour; seminar—2 hours. Prerequisite: consent of instructor. Coordination of concepts, principles, and information drawn from technical agriculture and the social sciences presented in the context of economic development. Special emphasis on the problems of program design and implementation.

192. Internship (1-12) I, II, III. The Staff (Thompson in charge)
Field placement—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 Mexican Agricultural Development** (3) III. Hansen (*Agricultural Economics*)
Field trip—8 days; seminar—four 2-hour sessions. Prerequisite: prior enrollment with consent of instructor required. Knowledge of Spanish not required. Observation of agricultural development strategies and impact on Northwestern Mexico. Discussion with farmers and agency staff members. Study of unique Mexican institutional arrangements and experiences in dealing with agricultural development problems. United States influences on Mexican agriculture. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Major Adviser in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Major Adviser in charge)
(P/NP grading only.)

Graduate Courses

280A-280B. Social, Technological, and Economic Factors; Strategies, Planning Procedures and Case Studies (3-3) II-III. McCalla (*Agricultural Economics*)
Seminar—3 hours. Prerequisite: consent of instructor. Problems and analysis in agricultural development; cultural, political, social, and economic organization; human factors in relation to resource use and technology; strategies and planning procedures in agricultural development; case studies of development programs in individual countries.

298. Directed Group Study (1-5) I, II, III. The Staff (Graduate Adviser in charge)
Selected topics relevant to advanced study in International Agricultural Development. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Graduate Adviser in charge)
(S/U grading only.)

International Relations

(College of Letters and Science)

Program Office, 351 Voorhies Hall (752-3063)

Committee in Charge

Paul E. Zinner, Ph.D. (*Political Science*),
Committee ChairpersonConrad J. Bahre, Ph.D. (*Geography*)²Arnold J. Bauer, Ph.D. (*History*), Winter-Spring
QuartersWilliam K. Domke, Ph.D. (*Political Science*)W. Eric Gustafson, Ph.D. (*Economics*)³James P. Hawley, Ph.D. (*Sociology*),
Winter-Spring QuartersH. Guenther Nerjes, Ph.D. (*German*)Rollie E. Poppino, Ph.D. (*History*), Fall Quarter

The Major Program

Cultural, economic, and political ties bind the world together more closely today than ever before. Problems of security, human rights, energy and mineral resources, and the environment are increasingly confronted at a global, rather than a national level. The challenge of world politics and the growth of international business have created dynamic opportunities for individuals with a background in international affairs. With its theoretical models and real world application, the study of International Relations has become an exciting, rapidly expanding, and highly relevant interdisciplinary major.

The International Relations Program at UC Davis provides a comprehensive approach to the study of today's complex world. This flexible and diverse undergraduate major is the only one of its kind in the nine-campus University of California system.

Graduation with a degree in International Relations requires completion of introductory courses in political science, economics, and history. Upper division work is composed of a "core" or classes (including a seminar in the senior year) required of all majors, and an additional set of courses chosen from one of three emphasis groupings or "clusters": political, economic, or regional. Working knowledge of a modern foreign language is also a requirement (approximately 26 units of course credit or the equivalent in course coverage).

One program of special interest to International Relations majors is the Education Abroad Program ("junior-year abroad"). Students of international affairs have found EAP an invaluable experience, providing insights into the life and culture of individuals in another country.

The work-learn program assists students in obtaining internships for academic credit related to their field of study. Legislative, legal, and business internships have proved to be the most popular among International Relations students. The "Davis in D.C." program arranges summer internships in Washington, D.C.

International Relations gives the student a wide range of opportunities for advanced study and for careers in agencies of the federal government—in the U.S. or abroad, state agencies, international or nongovernmental organizations, foundations, newspapers and companies with 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.

NOTE: For key to footnote symbols, see page 130.

International Relations

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	26-52
Economics 1A, 1B	10
Political Science 3	4
One course from Political Science 1, 2 or 9 (course 2 recommended if electing Regional cluster below)	4
Two courses from History 3, 4B, 4C, 7, 9A, 9B, 10, 15, 17B	8
Approximately 26 units (or the equivalent) in one modern foreign language	0-26
Recommended: one course in statistics, (e.g., Economics 12, Sociology 46A, 46B, Statistics 13)	
Depth Subject Matter	48
Political Science 127	4
Economics 115A, 160 or 162	8
One course from History 137C, 143C, 146B, 161B, 168, 192C, 194C	4
One course from Political Science 122, 123, 124, 125	4
Interdisciplinary seminar, Political Science 190 (normally taken in senior year)	4
Cluster emphasis	24
Choose one from the three clusters shown below, selecting six courses divided among at least three departments including at least two courses from each of two departments. Courses must be in addition to those applied toward requirements above.	
Total Units for the Major	74-100

Course List for Cluster Emphasis

- (1) *Economics Emphasis* (two courses in Economics required)
Anthropology 122
Economics 115B, 116, 117, 118, 119, 123, 161
Geography 141, 142, 143
History 115A, 115B, 115C, 137C, 143C, 144C, 145, 146A, 146B, 161B, 165, 168, 174B, 192C, 194C, 195
Political Science 117, 124, 125, 137, 139, 140, 178
Sociology 118, 139, 141, 170
- (2) *Political Emphasis* (two courses in Political Science required)
Anthropology 123, 128
Economics 115B, 116, 117, 118, 119, 123, 161
Geography 141, 142, 143
History 115A, 115B, 115C, 137C, 143C, 144B, 144C, 146B, 151D, 161B, 162, 163B, 166B, 168, 174A, 174B, 180C, 195
Political Science 112, 117, 121, 122, 123, 124, 125, 126, 128, 131, 132, 134, 137, 138, 139, 140, 141, 142, 144, 146, 147, 148A, 148B, 149, 176, 177, 178
Sociology 118, 130, 139, 141, 170, 185
- (3) *Regional Emphasis: Latin America, Europe, East Asia, Soviet Union and Eastern Europe, or Africa* (two courses in History required in the selected region)
Anthropology 128, 139A, 139B, 143, 146, 147A, 147B, 162, 190, 191, 192
Economics 110B, 115B, 116, 117, 118, 123, 161, 173
Geography 119, 121, 122A, 122B, 123A, 123B, 124, 125A, 125B, 127
History 115A, 115B, 115C, 116, 137B, 137C, 141, 143C, 144B, 144C, 146A, 146B, 147C, 151D, 161A, 161B, 162, 163B, 165, 166B, 168, 192C, 194C, 195
Political Science 131, 132, 134, 138, 139, 141, 144, 146, 147, 148A, 148B, 149, 175
Sociology 139, 147, 170

Major Adviser. P. E. Zinner (*Political Science*).

Italian

(College of Letters and Science)

Department Office, (French and Italian), 513
Sproul Hall (752-0830)

Faculty

Alfonso De Petris, *Dottore in Filosofia*, Associate
Professor

Dennis J. Dutschke, Ph.D., Assistant Professor

Gustavo Foscarini, M.A., Lecturer

Maria Manoliu-Manea, Ph.D., Professor

The Major and Minor Programs

The major in Italian is intended to provide a solid language background which will enable the student to pursue specific international job opportunities and to develop an appreciation for Italian language and culture. The program of Italian studies at UCD is small and geared to the individual needs of the student. A full range of courses is offered which satisfies the humanities and fine arts area requirement. 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. Also offered are literature courses in translation which are intended for those students not majoring in Italian. A course on Italian culture and civilization is also taught in English. Practical experience in education is provided through a teaching program offered in conjunction with the Davis Unified School District; students majoring in Italian are able to teach the language at the high school, under the supervision of a University faculty member.

A degree in Italian provides a well-rounded liberal arts background for graduate studies in the humanities and for a wide range of careers in such areas as civil service, business, travel, library science, and education. Above all, however, it gives the student an opportunity to read some of the greatest literature ever written and to study a country and people which have a uniquely rich culture and history.

A minor in Italian is available to those aware that a knowledge of foreign languages is of vital importance in today's increasingly international world. In every sector of society, language skills enhance our chances of getting jobs and successfully keeping them. In a more general sense, our understanding and appreciation of other cultures is dependent on our ability to perceive them clearly; there is no better means of perceiving a foreign culture than through its own language. 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: Milano 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.

Italian

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	0-21
Italian 1, 2, 3, 10A or 10B (or the equivalent)	0-21

Italian; Land, Air and Water Resources

Depth Subject Matter	36
Upper division courses in Italian	36
Two of these courses may be chosen from department approved courses in related fields.	
Total Units for the Major	36-57

Recommended

One year of college Latin or a Romance Language.

Major Advisers. G. Foscarini.

Minor Program Requirements:

	UNITS
Italian	20
Language, Italian 101, 102	8
Literature, three courses chosen in consultation with major adviser	12
One course chosen from each of the following three areas: Early Italian literature, Renaissance and Baroque, 18th through 20th Centuries. (One of the above courses may be replaced by course 107 or by a course of literature in translation offered by the Department).	

Prerequisite Credit. Credit will not normally be given for a course if it is prerequisite to a course already successfully completed. Exceptions can only be made by the Department Chairperson.

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 pages 63 and 97.

Teaching Credential Subject Representative. A. De Petris. See page 105 for the Teacher Education Program

Courses in Italian

Lower Division Courses

Students offering high school language preparation as a prerequisite must take a placement test.

1. Elementary Italian (6) I, II, III. The Staff
Discussion—5 hours; laboratory—1 hour. Basic Italian vocabulary and structure, aimed at enabling the student to understand and use standard Italian. (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 (6) I, II, III. The Staff
Discussion—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of course 1.

3. Intermediate Grammar (6) III. Foscarini
Discussion—5 hours; laboratory—1 hour. Prerequisite: courses 1 and 2 or the equivalent. Continuation of course 1 and 2 series, basic language preparation.

8A. Italian Conversation (3) I, III. The Staff
Discussion—3 hours. Prerequisite: course 2. A course designed to offer practice in speaking Italian. May be repeated once for credit. (P/NP grading only.)

8B. Italian Conversation (3) II, III. The Staff
Discussion—3 hours. Prerequisite: course 8A. A course designed to offer practice in speaking Italian. (P/NP grading only.)

10A. Intermediate Italian (3) I, III. The Staff
Lecture-discussion—3 hours. Prerequisite: courses 1 and 2. Reading and discussion of Italian short stories, newspaper articles, etc., providing an introduction to contemporary Italian society and culture while strengthening the student's command of standard Italian.

10B. Intermediate Italian (3) II. The Staff
Lecture-discussion—3 hours. Prerequisite: course 10A. Continuation of course 10A. Considered the minimum prerequisite for participation in Education Abroad Program.

25. Italian Literature in Translation (3) II. The Staff (Chairperson in charge)
Lecture—1 hour; discussion—2 hours. Course intended to acquaint the non-major with representative examples of Italian literature. Selected topics will include major authors, genres, literary periods, movements, or special themes.

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, De Petris
Lecture-discussion—3 hours; weekly essays. Prerequisite: course 10B or consent of instructor.

102. Advanced Conversation, Composition, and Grammar (4) III. De Petris
Lecture-discussion—3 hours; weekly essays. Prerequisite: course 101 or consent of instructor.

107. Survey of Italian Culture and Institutions (4) III. Foscarini
Lecture-discussion—3 hours; term paper. An 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.

***113A. Italian Literature before the Renaissance: from St. Francis to Petrarch** (4) I, Dutschke
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Study of the origins of lyrical forms of Italian literature of the thirteenth and fourteenth centuries. The development of an Italian standard of poetry, with emphasis on the Sicilian school of Poetry, the *Dolce Stil Nuova*, and Petrarch.

***113B. Italian Literature before the Renaissance: Dante's *Divina Commedia* and Boccaccio** (4) III. Dutschke
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Study of the origins of non-lyrical forms of Italian literature of the thirteenth and fourteenth centuries. *The Divina Commedia* and the development of a prose style (emphasis on Boccaccio's *Decameron*).

115A. Italian Literature of the Renaissance and the Baroque: from Humanism to Machiavelli (4) III. De Petris
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. The development of the Renaissance ideal of man and the subsequent loss of faith in this ideal as evidenced in the work of Lorenzo de' Medici, Poliziano, Ariosto and Machiavelli.

***115B. Italian Literature of the Renaissance and the Baroque: from Cellini to Marino** (4) III. De Petris
Lecture-discussion—3 hours; term paper. Prerequisite: course 115A. A 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.

***118. Italian Literature of the Eighteenth Century** (4) III. De Petris
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. The 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) I, De Petris
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Aspects of Romanticism in Italy; including Manzoni, Verga and *Verismo*.

***120A. Italian Literature of the Twentieth Century: The Novel** (4) II. Dutschke
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. The 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) II. Dutschke
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B 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.

***139A. Italian Literature in English: Early Italian Literature and Dante Alighieri** (4) I, Dutschke
Lecture-discussion—3 hours; term paper. The origin of the Italian Lyric Tradition with emphasis on authors of the Sicilian School, the *Dolce Stil Novo*, and *Dante's Vita Nova* and *Divina Commedia*.

***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.

***139C. Italian Literature in English: Modern Italian Literature** (4) III. Dutschke
Lecture-discussion—3 hours; term paper. The Romantic Movement in Italy in its relationship to European Romanticism with emphasis on Foscolo, Leopardi and Manzoni (offered in even-numbered years); twentieth-century Italian authors: differing emphasis according to the needs of the students. Offered in odd-numbered years.

150. Contrastive Analysis of Italian and English (4) II. Manea
Lecture—3 hours; term paper. Prerequisite: course 3 or the equivalent. Contrasting of the linguistic structures (morphology, phonology, syntax) of the two languages, with particular emphasis on the problems of speakers of either language with the learning of the other. To be taught in English. Offered in odd-numbered years.

194H. Special Study for Honors Students (5) I, II, III. The Staff (Abraham in charge)
Prerequisite: open only to honors students. Guided research leading to an honors paper.

197C. 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.)

199 Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (De Petris in charge)
Prerequisite: consent of instructor. Directed individual study for advanced undergraduate students. (P/NP grading only.)

Japanese

See Oriental Languages and Civilizations

Land, Air and Water Resources

(College of Agricultural and Environmental Sciences)

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Faculty

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Eugene L. Begg, B.S., Lecturer (*Soil Morphology*)

Francis E. Broadbent, Ph.D., Professor (*Soil Microbiology*)

A. Lloyd Brown, Ph.D., Lecturer (*Soils and Plant Nutrition*)

Richard G. Burau, Ph.D., Professor (*Soil Science, Environmental Toxicology*)

John J. Carroll III, Ph.D., Associate Professor (*Meteorology*)

Kinsell L. Coulson, Ph.D., Professor Emeritus (*Meteorology*)

C.C. Delwiche, Ph.D., Professor (*Geobiology*)

Emanuel Epstein, Ph.D., Professor (*Plant Nutrition, Botany*)

Robert G. Flocchini, Ph.D., Lecturer (*Solar Energy*)

Frank F. Harradine, Ph.D., Professor Emeritus
(*Soil Science*)
Gordon L. Huntington, Ph.D., Lecturer (*Soil Morphology*)
Andre E. Läuchli, Ph.D., Professor (*Plant Nutrition*)
Donald N. Munns, Ph.D., Professor (*Soil Science*)
Leonard O. Myrup, Ph.D., Professor
(*Meteorology, Environmental Studies*)
H. Michael Reisenauer, Ph.D., Professor (*Soil Science*)
Victor V. Rendig, Ph.D., Professor (*Soils and Plant Nutrition*)
Dennis E. Rolston, Ph.D., Associate Professor (*Soil Science*)
Roger H. Shaw, Ph.D., Associate Professor (*Meteorology*)
Michael J. Singer, Ph.D., Associate Professor (*Soil Science*)
Steven A. Stage, Ph.D., Lecturer (*Atmospheric Science*)
Kit K. Wagner, Ph.D., Assistant Professor (*Meteorology*)
Bryan C. Weare, Ph.D., Assistant Professor (*Meteorology*)
Harry O. Walker, Ed.D., Senior Lecturer (*Resource Sciences*)
Lynn D. Whittig, Ph.D., Professor (*Soil Science*)

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James W. Biggar, Ph.D., Professor (*Water Science*)
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Lloyd D. Doneen, Ph.D., Professor Emeritus (*Water Science and Engineering*)
Elias Fereras, Ph.D., Lecturer (*Water Science*)
Donald W. Grimes, Ph.D., Lecturer (*Water Science*)
Robert M. Hagan, Ph.D., Professor (*Water Science*)
Jerry L. Hatfield, Ph.D., Assistant Professor (*Meteorology*)
Delbert W. Henderson, Ph.D., Professor (*Water Science*)
Theodore C. Hsiao, Ph.D., Professor (*Water Science*)
Allen W. Knight, Ph.D., Professor (*Water Science*)
James N. Luthin, Ph.D., Professor (*Water Science, Civil Engineering*)
Elmer R. Malakoff, LL.B., Lecturer (*Water Science*)
Miguel A. Mariño, Ph.D., Professor (*Water Science, Civil Engineering*)
Robert J. Miller, Ph.D., Lecturer (*Water Science*)
Donald R. Nielsen, Ph.D., Professor (*Water Science*)
William O. Pruitt, Jr., M.S., Lecturer (*Water Science*)
Frank E. Robinson, Ph.D., Lecturer (*Water Science*)
Verne H. Scott, Ph.D., Professor (*Water Science, Civil Engineering*)
Wendy Kuhn Silk, Ph.D., Assistant Professor (*Water Science*)
Kenneth K. Tanji, M.S., Professor (*Water Science*)

Major Programs and Graduate Study. See the majors listed under Resource Sciences and Engineering on page 69. For graduate study see page 99 and the *Announcement of the Graduate Division*.

Related Courses. See course listings under Atmospheric Science, Resource Sciences, Soil Science, Water Science.

Latin

See Classics

Law, School of

Florian Bartosic, B.C.L., LL.M., Dean of the School
Daniel L. Simmons, J.D., Associate Dean of the School
Mary Jane Hamilton, J.D., Ph.D., Assistant Dean of the School
Mortimer D. Schwartz, J.D., LL.M., M.S., Associate Dean (Law Library)
Dean's Office, 1011 Martin Luther King, Jr. Hall (752-0243)

Faculty

²Homer G. Angelo, J.D., LL.M., Professor
¹John D. Ayer, J.D., LL.M., Professor
Edward L. Barrett, Jr., J.D., Professor
Florian Bartosic, B.C.L., LL.M., Professor
David F. Beatty, J.D., Visiting Lecturer
Brigitte M. Bodenheimer, J.U.D., LL.B., Professor Emeritus
Edgar Bodenheimer, J.U.D., LL.B., Professor Emeritus
Carol S. Bruch, J.D., Professor
Homer H. Clark, Jr., LL.B., LL.M., Visiting Professor
Charles B. Craver, J.D., Professor
Joel C. Dobris, LL.B., Acting Professor
²Harrison C. Dunning, LL.B., Professor
Daniel J. Dykstra, LL.B., S.J.D., Professor
Floyd F. Feeney, LL.B., Professor
Daniel W. Fessler, J.D., S.J.D., Professor
²Susan F. French, J.D., Professor
Gary S. Goodpaster, J.D., Professor
Theodore W. Graham, LL.B., Visiting Senior Lecturer
Sarah D. Gray, Ph.D., Visiting Lecturer (*Human Physiology, UC Davis School of Medicine*)
Frederick M. Hart, J.D., LL.M., Visiting Professor
James E. Hogan, LL.B., Professor
Margaret Z. Johns, J.D., Visiting Lecturer
¹Emma Coleman Jones, J.D., Professor
Friedrich K. Juenger, J.D., Professor
Cecilia D. Lannon, J.D., Visiting Lecturer
Ronald F. Lipp, J.D., Visiting Lecturer
¹Pierre R. Loiseaux, LL.B., LL.M., Professor
Jean C. Love, J.D., Professor
David W. Miller, LL.B., Acting Professor
John B. Oakley, J.D., Professor
Raymond I. Parnas, J.D., LL.M., S.J.D., Professor
John W. Poulos, J.D., Professor
Edward H. Rabin, LL.B., Professor
Mortimer D. Schwartz, J.D., LL.M., M.S., Professor
Daniel L. Simmons, J.D., Professor
James F. Smith, J.D., Visiting Lecturer
Edward M. Stadum, LL.B., Visiting Lecturer
Jerald L. Wilkerson, J.D., Acting Professor
Bruce A. Wolk, M.S., J.D., Acting Professor
Richard C. Wydick, LL.B., Professor

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 on page 117. The symbols are (I) for *Fall Semester* and (II) for *Spring Semester*.

Courses in Law

Professional Curriculum

First Year Courses

200. Introduction to the American Legal Process (1) I. Discussion (introductory week)—1 hour. An introduction to American Legal Process through study of how courts resolve disputes in selected areas. Emphasis will be placed upon the operation of the case law system, the law-making roles of the courts and the legislature, and the acquisition of the skills of a lawyer. (S/U grading only.)

201A-201B. Property (3-3) I-II. Dobris, Rabin
Discussion—3-3 hours. Study of doctrines and institutions which govern allocation and use of land and improvements thereon. Emphasis is placed upon estates-in-land system, landlord-tenant relationship, conveyancing, and private and public means for land use control. (Deferred grading only, pending completion of sequence.)

202A-202B. Contracts (3-3) I, Fessler, Graham; II, Fessler, Hart
Discussion—3-3 hours. Course examines the sorts of promises that are enforced at law and the nature of protection given. 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.)

203A-203B. Civil Procedure (3-3) I-II. Hogan, Lipp, Miller, Oakley
Discussion—3-3 hours. The methodology of presenting a civil controversy for adjudication in a state or federal court, without reference, however, to the rules and tactics relating to the proof of disputed facts, which are the subject matter of Evidence and Trial Practice respectively. In addition to jurisdiction, the principal matters studied are those governing the formulation of the issues in dispute in a particular case through pleading, joinder and discovery, the resolution of these issues at or before trial, and the finality of the trial court's disposition of the case. (Deferred grading only, pending completion of sequence.)

204A-204B. Torts (3-3) I-II. Dykstra, Juenger, Love, Wilkerson
Discussion—3-3 hours. Course in tort law is designed to familiarize the students with the legal concepts which apply to actions brought by litigants who seek relief for injury. It is thus concerned with intentional invasions of personality and property and with the unintentional invasion of these same interests. More specifically the course seeks to analyze civil actions based upon wrongs carrying labels such as: assault, battery, false imprisonment, negligence, defamation, invasion of privacy, misrepresentation, and nuisance. (Deferred grading only, pending completion of sequence.)

206. Criminal Law (3) I, Craver, Poulos
Discussion—3 hours. A study of the elements and policies of selected criminal offenses.

207. Legal Research (1) I, Johns, Parnas
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. Completed in twelfth week of semester. No final examination.

208. Legal Writing (2) II, Johns, Parnas
Discussion-laboratory—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: Law 209, 250, 254, 258, 283
(b) Business Law: Law 213, 214, 215, 228, 229, 232, 236, 241, 262, 270, 274, 277
(c) Commercial Law: Law 216, 237, 243
(d) Constitutional Law: Law 217, 218, 288
(e) Consumer Law: Law 253, 269, 284
(f) Criminal Law: Law 226, 227, 233, 273, 275, 276, 290
(g) Estate Planning: Law 221, 222, 223
(h) Family Law: Law 225, 230, 234, 267, 272, 281
(i) Health Law: Law 266
(j) International Comparative and Foreign Law: Law 248, 249, 255, 257, 270, 293
(k) Labor Law: Law 251, 259, 260, 278, 279, 295
(l) Procedure and Jurisdiction: Law 219, 242, 246, 283
(m) Property and Environmental Law: Law 232, 256, 264, 285, 293, 294
(n) Public Law: Law 231, 235, 240, 261
(o) Skills and Litigation: Law 210, 211, 212, 263, 291, 297, 410, 415
(p) Taxation: Law 220, 228, 232, 238, 245, 247, 268, 271

- (q) Topical Survey Courses: Law 239, 244, 266, 282, 289, 292, 298, 299
 (r) Clinical Programs: Law 420, 430, 450, 460, 470, 480, 485, 495

209. Legal Process (2) II. Oakley

Seminar—2 hours. Open to second and third year students on an equal basis. Course is concerned with the concept of "law" and with what distinguishes a legal system from other forms of social control. Principal readings are the works of H.L.A. Hart, who argues that law is analytically distinct from morality, and Ronald Dworkin, who argues that the separation of law and morals is more imagined than real. This seemingly esoteric issue of the relationship between law and morality is shown during the course to be fundamental to an understanding of the very practical and cogent questions of how much discretion judges ought to exercise — and how much discretion they do in fact exercise — in deciding "hard" cases in which respectable legal justifications can be constructed for a decision either way. Exploration of the concept of law thus leads to a better understanding of judicial reasoning, and an enhanced ability as an advocate to frame the issues of a case from the perspective of the court which must decide those issues. Reflection on the role of moral and political theory in the decision of hard cases leads to a deeper understanding of the development of American constitutional law, and stimulates informed criticism of current trends in constitutional adjudication.

210. Skills (2) I, II. Goodpaster

Laboratory—2 hours. Course designed to introduce second-year students to the judgmental and practical skills exercised by the practicing lawyer. Through simulations, role-playing and the use of videotape, training will be given in interviewing and counseling, preventative law, the drafting of pleadings and other legal papers, and advocacy and negotiations skills, both in civil and criminal cases. Students will be individually required to resolve a series of legal problems generated from real fact patterns, and their work will be individually critiqued. Recommended for students planning to undertake clinical work. Enrollment limited. (S/U grading only.)

211. The Lawyer as Negotiator (2) II. Craver

Discussion-laboratory—2 hours. Course examines the negotiation process generally engaged in by legal practitioners. Reading materials consist of writings by attorneys, psychologists, and psychiatrists. Some concern the negotiation process in specific contexts, such as labor bargaining and personal injury settlements. Others only tangentially consider the negotiation process, focusing instead upon such areas as nonverbal communication, visible manifestation of anxiety, and stress reaction. Students will be required to engage in four or more mock negotiations. A short (10-15 page) paper on some topic related to the course will also be required. Classroom discussion will examine specific negotiation situations of concern to lawyers, and will consider the impact of social psychology upon the negotiation process. The mock negotiations not only provide students with practice in the art of negotiating, but also permit them to examine their own personal limitations. Since each student's grade will be determined in large part by the negotiation which he or she obtains vis-a-vis other class members, the negotiations will, in reality, be bargaining for a grade. Limited enrollment.

***212. Public Interest Law Seminar (2)**

Seminar—2 hours. Prerequisite: consent of instructor. Discussion of role of litigation as a tool for social change, followed by an in-depth examination of the practical aspects of a public interest lawsuit. Subjects discussed will include whether and when litigation should be pursued; and practical problems that face the public interest lawyer, including framing of issues (role of creativity in developing legal solutions to social problems); selection of plaintiffs (legal problems of "standing" and ethical problems of solicitation); appropriate defendants (who must be sued and who should be); appropriate forum; common defenses, etc. Primary course materials will be the pleadings, briefs, and decisions from public interest cases. Students will be expected to form their own public interest lawsuit. Limited enrollment.

213. Business Organizations I (3) I, Fessler

Discussion—3 hours. The business enterprise owned by relatively few persons is the focus on this course. While some treatment is given the partnership and limited partnership, the main emphasis is upon the close corporation and its emerging status under both the decisional and statutory law of the State of California. The materials are examined in a planning context and stress the structuring of legally effective and efficient arrangement for control, management, and dissolution of the close corporation as well as arrangements governing profit sharing and transfer of ownership interests. The fiduciary concepts relevant to this kind of business organization are taken up.

214. Business Organizations II (3) II. Clark

Discussion—3 hours. Building upon the concepts developed in Business Organizations I, the focus of this practi-

tioner-oriented offering is upon the legal problems surrounding the dominant phenomenon of the industrial state — the public issue of corporation. Comparative attention is given to the traditional statutory and judge-made legal principles as well as to the rapidly expanding "federal corporation law." Among the areas studied are: the governance of the public issue corporations (its operations through a board of directors, committees and officers); the prerogatives of shareholders in the decision-making process; the increasing importance of the concept of corporate social responsibility; and the impact of federal regulation of the proxy system and sale of securities.

215. Business Associations (4) I, Clark

Discussion—4 hours. As an alternative to the more detailed and practitioner-oriented concept of the Business Organizations I and II sequence, this course is intended primarily for those students interested in a broad survey of the legal rules and concepts applicable to corporations both closely and publicly held. Topics surveyed include the process of incorporation, the financing of corporations, the role of management, the role of shareholders and the means by which corporate structure can be rendered accountable to the socioeconomic demands of the modern state.

216. Commercial Law (3) II. Hart

Discussion—3 hours. The basic course in Commercial Law. Emphasis on secured commercial transactions, particularly under Article 9 of the Uniform Commercial Code. Course covers creation of security interests, the relationship between the secured party and the debtor during the existence of the debt and the enforcement of the agreement upon default. Enrollment in this course is helpful before, although not a prerequisite to, enrollment in Debtor and Creditor.

217. Constitutional Law I (3) I, Barrett, Poulos

Discussion—3 hours. Separation of powers, including the case and controversy doctrines and powers of the President. Division of powers between the national government and the states. Constitutional limitations on governmental power derived from the due process clause.

218. Constitutional Law II (3) II, Barrett, Poulos

Discussion—3 hours. Equal protection; the state action concept; freedom of speech and religion.

219. Evidence (4) I, Wydick; 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 Taxation I (4) I, Wolk; II, Simmons

Discussion—4 hours. A study of the statutory, judicial, and administrative material concerning federal income taxes.

221. Trusts, Wills and Decedents' Estates I (3) I, Dobris

Discussion—3 hours. Introduces students to estate planning by study of the basic estate planning devices and fiduciary administration. Course coverage includes: intestate succession; family protection and limits on the power of testation; execution, revocation and revival of wills; introduction to interpretation of wills; contracts to make wills; will substitutes; creation, modification and termination of inter vivos and testamentary private trusts; the nature of the beneficiaries' interests in private trusts; introduction to charitable trusts; introduction to the administration of estates and trusts, including probate and contest of wills; powers, duties, rights and liabilities of fiduciaries; management of assets; and fiduciary accounting.

***222. Trusts, Wills and Decedents' Estates II. (2)**

Course prepares students to draft the dispositive provisions of estate plans. Course coverage includes: language used to create future interests; utility and operation of conditions of survival; two essential estate planning devices, class gifts and powers of appointment; construction of ambiguous and defective dispositive provisions; and operation of the Rule Against Perpetuities, including drafting to avoid violations of the Rule, and the impact of violations on the dispositive plan.

223. Estate Planning (2) II, Dobris

Discussion—2 hours. Prerequisite: courses 221, 222, and 245. Problem course concerning preparation and administration of estate plans.

225. Marital Property (3) I, II, Bruch

Discussion—3 hours. The California community property system, marriage dissolution and nullity proceedings; legal implications of non-marital cohabitation; property, support, tax consequences of marriage dissolution; marital property settlement agreements; ante-nuptial and related contracts.

226. Criminal Procedure (Short Course) (2) I, Barrett

Discussion—2 hours. The police function: arrest, search, surveillance, confessions, lineups, the exclusionary rule.

227. Criminal Procedure (Long Course) (3) II, Feeney

Discussion—3 hours. Covers the same material as course

226, plus consideration of post-arrest phases of the criminal process with major emphasis on prosecutorial discretion and plea bargaining. Strongly suggested for those students planning to take the Clinical Program in the Administration of Criminal Justice.

228. Business Planning (2) II, Wolk

Discussion—2 hours. Consideration of selected problems in business planning.

***229. Problems of Small Business (1-2)**

Seminar—1-2 hours. Consideration of selected problems of counseling small businesses.

***230. Family Law (Short Course) (2)**

Discussion—2 hours. Legal aspects of marriage, the family and dissolution. Among the subjects covered are support, custody, paternity, illegitimacy, adoption and intrafamily violence. Family law reform in the United States and elsewhere and recent California developments will be included.

***231. Legislative Process (2)**

Discussion—2 hours. Emphasis is on providing an understanding of the California legislative process, theoretically and in practice. This goal is approached in two ways. First, there are readings, discussion and guest speakers. Second, preparation of a single mock bill by the class as a whole is required. This involves role playing, a variety of written assignments, and bill drafting, all culminating in an oral presentation as a lobbyist before a mock legislative committee. Recommended as a prerequisite to course 460, Clinical Program in the Legislative Process.

232. Real Estate Finance (3) II, Rabin

Discussion—3 hours. An examination of the problems to be considered in the acquisition, financing and development of real estate. Course will emphasize current California real estate law and practice.

233. Philosophy of Responsibility and Punishment (2) II, Poulos

Seminar—2 hours. Interdisciplinary approach to some basic problems of criminal justice, among them the following: (1) the relation between freedom of the human will and the imputation of legal responsibility; (2) justifications and criticisms of the notion of punishment; (3) policies of sentencing; (4) excuses from criminal responsibility, especially mental disease.

234. Family Law Practice (3) II, Lannon

Seminar—2 hours. Prerequisite: course 230 or 272; course 225 (concurrently). Combined seminar and clinical course will provide practical experience in family law. Students will provide marital-legal counseling under direct supervision of instructor. Seminar will cover wide range of topic areas pertaining to family law practice. Limited enrollment. (S/U grading only.)

235. Administrative Law (2) II, Dunning

Discussion—2 hours. Control of the administrative operations of government, both regulatory operations such as approval or prohibition of business practices and social service operations such as welfare. The powers exercised by administrative agencies, principles governing the exercise of those powers and the legal remedies of persons aggrieved by administrative action will be examined. California as well as federal administrative law will be treated, and students will be expected to engage in some direct study of the administrative process as it operates in Sacramento.

236. Securities Regulation (2) I, Dykstra

Discussion—2 hours. Prerequisite: courses 213 and 214, or course 215. The primary purpose of this course is to familiarize students with laws and regulations, federal and state, relating to the issuance of and trading in corporate securities. It includes materials pertaining to the scope of the term "securities," the registration of securities, intrastate and private offerings, broker-dealer regulations and civil liability under the Securities Act of 1933 and the Securities Exchange Act of 1934.

237. Commercial Paper (2) I, Johns

Discussion—2 hours. A course in commercial paper covering Articles 3 and 4 of the Uniform Commercial Code. This will cover concepts of negotiability, requisites of negotiable paper, transfer, liability of parties, and rights of holders. The Article 4 coverage includes a discussion of deposits and collections and the relationship between banks and customers. The relationship of parties in credit card transactions will also be considered.

238. Income Taxation of Partners and Partnerships (2) II, Wolk

Discussion—2 hours. Prerequisite: course 220. Study of Federal income tax problems encountered in organization and operation of partnerships, including problems created by death or retirement of partner, sale of partnership interest, and distribution of partnership assets.

***239. Insurance (2)**

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.

***240. Law of Elections and Political Campaigns (2)**

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.

***241. Legal Accounting (2)**

Discussion—2 hours. Course considers the application of accounting practices and procedures to a variety of situations arising from financial, tax, business, and legal transactions. Basic concepts will be stressed to assure that accounting fundamentals are understood and that their relation to legal problems may be demonstrated.

242. Conflicts of Laws (4) II. Bruch

Discussion—4 hours. A study of transactions with multistate contacts. The topics covered include jurisdiction, effect of foreign judgements, and choice of applicable law. Special attention will be given to the influence of varying theoretical considerations on the resolution of conflicts problems.

243. Debtor and Creditor (3) II. Graham

Discussion—3 hours. Prerequisite: Commercial Law recommended. Course focuses on the rights of debtors and creditors. The first part concentrates upon remedies of unpaid creditors under state law and the protection of debtors through limitations on creditors such as exemption laws. The second part involves a study of the Federal Bankruptcy Act with emphasis upon ordinary bankruptcy.

244. Basic Human Physiology (2) II. Gray

Discussion—2 hours. An overall view of the principles of physiology with the object of giving the law student some understanding of the normal functioning of the various organ systems of the human body. (S/U grading only.)

245. Estate and Gift Taxation (3) I. Wolk

Discussion—3 hours. Prerequisite: course 220. A study of the federal taxation of gifts, trusts, and estates.

246. Federal Jurisdiction (3) I, Oakley; II, Love

Discussion—3 hours. Survey of federal court system and examination of sources and substance of federal jurisdiction. Attention will be devoted to: (1) parameters of appellate and collateral review of state court decisions in federal courts and of federal question, diversity, and maritime jurisdiction of federal trial courts; (2) justiciability, abstention, sovereign immunity and other constraints on exercise of federal jurisdiction; (3) rules of decision applied in federal courts; (4) dynamics of precedent and authority among federal courts and between federal and state courts; and (5) political factors in exercise of federal jurisdiction.

247. Federal Taxation II (3) I, Simmons

Discussion—3 hours. Prerequisite: course 220. Emphasis on income tax problems of corporations and their shareholders. The class considers problems on the organization, financing, operation, dissolution and reorganization of corporate entities.

248. International Law (3) II. Angelo

Discussion—3 hours. A survey of the fundamental problem in, and methods for carrying out, relations between nations. Research resources will be identified. The course will examine national law systems and the interplay between them, international law, international organizations, and individuals throughout the world. The shortcomings of the classical system of international law will be examined in the light of emerging problems foreseen for the last part of this century. Such issues include: the role of the developing nations, the growth of international organizations, human rights, control of terrorism, law of the sea and outer space, arms control, and transfer of international technology.

249. Comparative Law (2) I, Juenger

Discussion—2 hours. Comparison of the methods and sources of common and civil law; background and structure of the principal civil codes; analysis and study of problems arising in the context of foreign legal systems.

250. Jurisprudence (2) I, Goodpaster

Discussion—2 hours. The aim of this course is to offer a view of the legal system as a whole from a philosophical, psychological, and sociological perspective. The problems connected with the taming of power and control of aggression will receive special attention. The merits of law as an institution will be debated against the background of influential anti-law theories, and the relation of law to fundamental social values, such as freedom, equality, and security, will be analyzed. Various viewpoints concerning the nature and functions of the law will be tested with respect to their pragmatic impact upon the administration of justice.

251. Labor Law (4) II. Craver

Discussion—4 hours. A study of the law, primarily statutory, relating to: employee organization and the establishment of the collective bargaining relationship; the negotiation and

administration of the collective bargaining agreement; the exertion of primary and secondary economic pressure; and the rights of individual employees vis-a-vis their employer and their union.

253. Products Liability (2) II. Dykstra

Discussion—2 hours. The civil action for harm to the consumer resulting from dangerous and defective products.

***254. Developmental Legal History (2)**

Discussion—2 hours. While some fifteenth-, sixteenth- and seventeenth-century English materials will be used, course will focus on certain major transformations in Anglo-American legal doctrine during the period 1780-1880. The emergence of a conscious conception of law as an instrument of wealth regulation and allocation will be charted by examination of selected facets of the relationship between economic development and transformations in legal doctrine during the nineteenth century. Related topics include: changes in legal doctrine due to the emergence of competitive economic uses; the recognition of functional and doctrinal limitations upon the absoluteness of rights in real property; and the early experience with the promotion, regulation and evolution of a transportation matrix with emphasis on the security of private investment vs. the demands of public convenience and necessity.

***255. Transnational Law Seminar (2)**

Seminar—2 hours. Study of selected problems presented by transactions that cross national boundaries, including conflicts of regulatory laws and transnational institutions.

256. Land Use Planning (2) I, Beatty

Discussion—2 hours. The legislative, judicial, and administrative methods used to facilitate the rational use of land. Legal topics considered within this context will include zoning, subdivision regulation, nuisance, eminent domain, and city planning.

***257. Law and Institutions of European Communities (3)**

Discussion—3 hours. A study of legal problems of European integration, including the transfer of powers to supranational institutions, their decision making, the rule of the Court of the Community and discussion of selected areas of Community law.

258. Legal Profession (1) I, Goodpaster; II, Schwartz, Wydick

Discussion—1 hour. Study of the ethical duties and responsibilities under the American Bar Association Code of Professional Responsibility, the California Rules of Professional Conduct, and the Code of Judicial conduct. Required of all students for graduation. (S/U grading only.)

***259. Social Legislation in Employment (3)**

Discussion—3 hours. This course explores the rights of employees and the duties of employers under modern social programs including worker's compensation, unemployment compensation, wage and hour regulations, social security legislation, and anti-discrimination laws.

260. Employment Discrimination (2) II. Craver

Discussion—2 hours. Consideration of employment discrimination based upon race, color, religion, sex, national origin, alienage, age, handicap, and sexual preference. The course will focus upon Title VII of the Civil Rights Act of 1964, the Civil Rights Act of 1866, and the affirmative action programs established pursuant to Presidential Executive Orders. State fair employment laws and national labor relations statutes will also be discussed.

***261. Local Government (2)**

Discussion—2 hours. Will examine a number of recurrent issues concerning the organization and structure of local governments. Why have local governments at all? What functions are appropriate for local governments, and which can best be left to private persons? What standards are "fair" for the organization and operation of local governments? Who should pay to support them, and what should the supporters get in return? Not covered, because they are covered in separate courses, are land use control and public employee bargaining.

262. Antitrust (3) I, Wydick

Discussion—3 hours. Study of the federal antitrust laws including price fixing, limits on distribution, tying arrangements, monopolization and mergers.

263. Trial Practice I (3) I, Stadum

Lecture—approximately 45 hours total. Prerequisite: course 219. Course features lectures, videotapes and demonstrations aimed at exposing a student to the litigation process in its entirety, but with special emphasis on the trial itself.

264. Water Law (3) II. Dunning

Discussion—3 hours. Emphasis is placed upon appropriate and riparian rights to surface waters and upon the rules used to allocate ground water. Also included are water pollution control, water distribution organizations, interstate allocation, federal water development programs, environmental protection in water resources development and Indian water rights.

***266. Law and Medicine (2)**

Seminar—2 hours. Prerequisite: second-year medical students and second- and third-year law students with consent of instructor. A seminar approach emphasizing class work, field trips, and individual projects relevant to medical education and practice, attorney-physician relations, development of human behavior, community health care, and current medico-legal problems. Enrollment limited. (Same course as Family Practice, Medicine 266.)

***267. Family Law Seminar (1)**

Seminar—1 hour. Prerequisite: course 230 recommended. Detailed consideration of selected problems in family law.

***268. Taxation of Foreign Income (2)**

Seminar—2 hours. Analysis of the manner in which the United States taxes foreign source income and income of foreign corporations and aliens. Special emphasis will be given to the use of the controlled foreign corporation as an avoidance device and to tax incentives for the export of U.S. products (i.e., domestic international sales corporations). Consideration will also be given to such topics as Western Hemisphere Trade Corporations, income from U.S. possessions, the foreign tax credit and tax treaties. Problem approach will be followed.

***269. Consumer Protection (2) II.**

Discussion—2 hours. A study of selected consumer law problems, including a survey of state and federal regulatory efforts. Course coverage may include the following: First Amendment protection of commercial speech, common law and statutory remedies for fraudulent or deceptive practices, consumer credit regulation, equal credit opportunity legislation, preservation of consumer defenses, product safety, and attorney fees for representing consumers.

270. International Business Transactions (1) II. Angelo

Seminar—1 hour. Sampling of legal problems and techniques in international trade and investment, with examination of documents from actual transactions. Participants and guest lecturers will look at transfer of goods and services and documentation and financing of such transactions; establishing branches and affiliates of corporations in foreign jurisdictions; taxation in more than one country; legal reaction to boycott and ethical problems; antitrust, regulation by international organizations such as the GATT. (S/U grading only.)

***271. Advanced Taxation Seminar (1-2)**

Seminar—1-2 hours. A study of selected problems of public policy in relation to the tax law.

272. Family Law (Long Course) (3) II. Clark

Discussion—3 hours. Designed for the student with a substantial interest in Family Law and Children and the Law. It covers in depth material offered in the basic (short) course and in addition treats the child and education; child labor; emancipation; and child abuse.

***273. The Law and the Police (2)**

Discussion—2 hours. Prerequisite: course 226 or 227 recommended. A study of all aspects of legal control of police practice and behavior. In addition to constitutional problems such as arrest, search and seizure, line-ups and confessions, attention will be given to state legislation, municipal codes, basic authorizing statutes, administrative practices, and informal controls. (An additional unit of credit either as research or as clinical experience is available to students with consent of instructor.) Limited enrollment.

274. Unfair Trade Practices (2) II. Wydick

Discussion—2 hours. A study of unfair competition and the protection of intellectual property. Among the topics considered are consumer fraud, misleading and false advertising, disparagement, interference with business relationships, the role of the Federal Trade Commission, trade secrets, patents, trademarks and copyrights.

***275. The Correctional Process (2)**

Discussion—2 hours; field trips. Prerequisite: course 226 or 227. From pre-sentence report through disabilities of offenders. Major emphasis is not on prisoner's rights but rather it is on the lawyer's role vis-a-vis sentencing alternatives. Guest speakers and field trips. Sentencing simulations and a paper may be required in lieu of a final examination.

276. Juvenile Justice Process (2) I, Feeney

Discussion—2 hours; field trips. Legal and philosophical bases of a separate juvenile justice process; police investigation, apprehension and diversion; probation intake and detention; juvenile course hearing and disposition; juvenile corrections. Major emphasis is on the emerging role of counsel at each phase of the process. Guest speakers and field trips. A paper may be required in lieu of a final examination.

***277. Corporate Finance (2)**

Discussion—2 hours. Prerequisite: courses 213, 214 or 215. Economic and legal problems arising in connection with financing decisions of publicly held corporations, including valuation of the enterprise and its securities, deter-

NOTE: For key to footnote symbols, see page 130.

mination of securities structure and dividend policy, and decisions of investment opportunities, whether by internal expansion or by merger or take-over. Consideration will also be given to the rights and remedies of senior security holders.

278. Individual Rights and Union Authority (2) II. Bartosic Seminar—2 hours. Prerequisite: consent of instructor. A study of the role of law in promoting union democracy, including the legal bases for judicial intervention in internal union affairs, compulsory unionism, the right to admission and fair representation, civil liberties of members, disciplinary proceedings, financial administration, election of officers, trusteeships, racketeering and political activities. Limited enrollment.

***279. Employment Relations in the Public Sector** (3) Discussion—3 hours. Prerequisite: course 251 recommended. A study of the individual and collective rights of public employees. Consideration is given to constitutional protections and to legislation and executive orders relating to state and federal labor relations.

***281. Children and the Law** (2) Discussion—2 hours. Prerequisite: course 217 recommended. This course will consider the child in relationship to the family and society. Attention will be given to paternity and legitimacy, custody, foster care, and adoption; juvenile court proceedings, rights to support, health, birth control, and education; welfare law; and legal capacity and emancipation. The course will focus on the extent to which the law recognizes the emotional needs and development of the child.

***282. Sex Discrimination and the Law** (2) Discussion—2 hours. Prerequisite: course 217 recommended. Topics covered are historical and sociological background; constitutional law and the proposed Equal Rights Amendment; education; employment; reproduction control; the treatment of women in criminal law; and women in the legal profession.

283. Remedies (3) I, Love Discussion—3 hours. Study of common law remedies: damages, specific performance, injunctions, and restitutionary relief. Focus of course will be on the nature of equitable remedies and on continuing significance of distinction between legal and equitable relief, despite the merger of law and equity.

***284. Consumer Credit** (2) Discussion—2 hours. Students survey a range of commercial law topics, mostly from the perspective of the attorney, public or private, who defends consumers. Principle items of inquiry include the regulation and disclosure of finance charges, usury, creditors' disclosures, bankruptcy and consumer class actions. No other commercial law course is either a prerequisite or a bar to this one.

***285. Environmental Law** (2) Discussion—2 hours. Introduction to constitutional, common and administrative law dealing with environmental protection and pollution control. Emphasis is placed upon National Environmental Policy Act and on California Environmental Quality Act. Special attention is given to environmental aspects of energy production, distribution and use, such as water quality and air quality aspects. Water, coal, oil, natural gas, uranium, and electricity fuel cycles are considered.

***287. Public Land Law** (2) Discussion—2 hours. The law governing the management of public lands, with emphasis on the federal lands managed by the Bureau of Land Management and the Forest Service. After an overview of the history of public land disposition in the American West, the nature of the land management agencies and questions of federal and state authority, a number of particular topics will be studied. These will include the law of grazing, hardrock mining, oil and gas leasing, coal leasing, geothermal leasing, logging, fish and wildlife, recreation, preservation (parks, monuments, and wilderness areas) and the special problems of managing public lands in Alaska.

288. Constitutional Law Seminar (2) II. Barrett Seminar—2 hours. Prerequisite: course 217. Focus will be on Indian tribes as governments. Purpose of course will be to explore the special governmental status of Indian tribes on reservations. Legislative and judicial jurisdiction of tribal governments over Indians and non-Indians will be examined along with any constitutional limitations upon such jurisdiction. The course is designed to give the background necessary for understanding the role of tribal governments—an understanding necessary both for lawyers representing Indian tribes and lawyers representing non-Indians doing business on or residing on Indian reservations. The course will be conducted as a small-group discussion of the major cases. A casebook will be used and an examination given.

289. Law and Poverty (2) II. Goodpaster Discussion—2 hours. A selective study of the processes,

institutions, laws and practices which produce, maintain, exacerbate, regulate, or otherwise affect the conditions of being poor, together with an examination of the role of law and the lawyer in ending poverty, its sustaining conditions, and effects.

290. Criminal Justice Administration Seminar (2) I. Feeney Seminar—2 hours. Prerequisite: course 226 or 227 recommended. Consideration of current reform efforts in criminal justice administration. Emphasis will be on the pre-trial process. Specified topics will include bail reform and pretrial detention, criminal discovery, and the charging process.

291A-291B. Litigation Seminar (2-2) I-II. Wilkerson Laboratory-lecture-discussion—2 hours (flexible); variable meetings with instructor. Prerequisite: courses 219 and 263 (concurrently) recommended. Student receives intense participative exposure to litigation process. In 291A, following brief series of lectures, demonstrations and assigned readings, student participates in a variety of forensic drills simulating the basic components of a trial (e.g., opening statements, direct and cross-examination of lay and expert witnesses, introduction of physical evidence, closing arguments). During this phase student is assigned to small (2-3 people) law firm and, under general supervision of a "senior partner," undertakes responsibility of preparing and conducting a substantial case through the complete litigation process from initial client interview to jury trial (usually mid-spring), including factual investigation, legal research, pleading, discovery, and law and motion practice. In connection with the Trial Practice II program, seminar students prepare simulated case-files, and serve as trial advisers. Seminar students are selected to participate as prosecution and defense counsel in California Highway Patrol Academy mock trial program. (S/U grading only, deferred pending completion of course.)

***292. Immigration Law and Procedure** (2) Seminar—2 hours. The course will include consideration of the following subjects: constitutional basis for exercise of power of exclusion and deportation; constitutional basis for distinction between citizens and non-citizens; entry of non-citizens into the United States; administrative arrest; deportation of non-citizens, appeals within the INS and judicial review; subversive non-citizens; non-citizen criminal conduct, and non-citizen employment.

293. International Legal Efforts to Preserve the Environment (2) II. Angelo Seminar—2 hours. Recognizing that environmental problems cross national boundaries, participants will examine the imperfect international law and the emerging network of inter-nation treaties on the environment. Participants will be directed to research sources on items of special interest to them, such as the United Nations Environment Program which has emerged from the 1972 Stockholm Conference, the current Law of the Sea Negotiations, international energy transactions, and regional environmental programs, such as in the European Community, Asia and Africa.

294. Trusts and Wills (4) II. French Discussion—4 hours. Designed for the student who does not intend to specialize in estate planning, but who does anticipate drawing some wills and trusts. Course coverage includes: intestate succession; family protection and limits on the power of testation; execution, revocation and revival of wills; introduction to interpretation of wills; contracts to make wills; will substitutes; creation, modification and termination of inter vivos and testamentary trusts; introduction to charitable trusts; dispositive provisions of wills and trusts including class gifts, powers of appointment, requirements of survival and the rule against perpetuities; introduction to the probate process and fiduciary responsibilities. Students who have taken Trusts, Wills and Decedents' Estates I may enroll for 1 unit 299 credit to study the material on dispositive provisions, which will be taught the last 5 weeks of the semester.

***295. Labor Arbitration** (2) Discussion—2 hours. Prerequisite: course 251. A study of the labor arbitration process and the manner in which various provisions of collective bargaining agreements are interpreted and applied.

***297. Appellate Advocacy** (2) Discussion—2 hours. General introduction to civil practice in state appellate courts. Course will include: limits of appellate review; an inquiry into decisional motivations as a guide to tactics; perfecting the record on appeal; techniques of briefing and argument; extraordinary writs as a means of pretrial review, and petitions for State Supreme Court hearing. Limited enrollment with preference given to students who have had or are currently enrolled in courses 410 and 495, and second preference given to students who have completed course 208B.

298. Group Study (1-4) I, II. The Staff Groups of students (not less than 4 nor 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) program may extend over no more than two semesters; 2) 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) 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 to the faculty board 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) project may extend over no more than two semesters; 2) each project will be under the supervision of a faculty member (normally, no faculty member will be permitted to supervise more than 5 students working on individual programs during any semester); 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) student must submit an individual paper or approved alternative to the supervising faculty member; 5) grading will be on a S/U basis unless a request for letter grading has been made in advance.

Professional Courses

410. Moot Court Competition (1-2) I, II. The Staff Laboratory—2 hours. Participation as a competitor in up to two semesters of any one of the following intramural or extramural moot court programs: Neumiller, Jessup, Traynor, Environmental, or National Moot Court. Approval of the Moot Court Board is required for enrollment. (S/U grading only.)

415. Trial Practice II (1) I, II. Wilkerson Laboratory—1 hour. Students form into teams to litigate mock civil and criminal trials. Students participate in a variety of forensic drills prior to the actual jury trial of their case. (S/U grading only.)

420. Individual Clinicals (1-12) I, II. The Staff Clinical Program. Prerequisite: relevant substantive and procedural courses recommended. Students may engage in individual clinicals of their choice with the approval of the clinical committee and under tutelage of individual faculty members. A detailed outline of the proposed clinical work, endorsed by the proposed sponsoring faculty member, should be submitted to the Clinical Office one month prior to the beginning of the semester in which credit is requested. The clinical must be under appropriate legal supervision and designed to maximize educational benefits. With the exception of a clinical semester away, a student may enroll in no more than six units of individual clinical study in any one semester or any one clinical placement. Four to five office hours are required per unit per week. A full-time clinical semester (no other course) may be taken for 12 units; one course may be taken in conjunction with a clinical semester away with the permission of the dean, receiving less than 12 units for the clinical and not more than 14 semester units during such a semester. For a more complete description of the policies and procedures governing the design, approval, requirements and limitations of individual clinicals, please see the "Guidelines for Clinicals" obtainable from the Dean's Office or Clinical Office. (S/U grading only.)

430. Clinical Program in Civil Legal Services (3-5) I, II. Smith Clinical Program. This program is designed to introduce students to the legal problems of the poor and the practice of lawyering for the poor. Students will be assigned to local legal aid offices and specialized programs where they will receive a structured clinical experience ranging from interviewing and assisting clients, going to court, drafting pleadings and other legal documents, to assisting in law reform activities. Placements will be for a minimum of 10 hours or 3 units. Students will also participate in a seminar keyed to their poverty law practices. The seminar will consist of skill developments (interviewing, counseling and negotiations) by instruction, filming of simulated sessions and individual critiquing. Legal services practitioners and judges will appear at other seminars, as guest speakers. May be repeated for credit for a maximum of 10 units. (S/U grading only.)

450. Clinical Program in Environmental Law (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. (For purpose of this course, "environmental law" includes land use control by public means.) Students will

also be required to prepare a bi-weekly journal, noting, commenting upon, and reflecting upon their clinical experience. (S/U grading only.)

460. Clinical Program in the Legislative Process (2-4) II. Parnas

Clinical Program. Prerequisite: course 231 recommended. This program is designed to provide students with practical experience in the operation of the office of a legislator or the operation of a legislative committee for 7 to 14 hours per week. The major thrust of the program is to enable students to become familiar with the give and take realities of the process of making laws as contrasted with their interpretation and enforcement. Journals and seminar attendance are required. (S/U grading only.)

470. Clinical Program in the Administration of Criminal Justice (4-12) I, Parnas; II, Goodpaster

Clinical Program. Prerequisite: courses 219, 226, 227 and 263 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; Fall enrollment limited to third-year students. (S/U grading only.)

480. Legal Problems of the Prison Inmate (2-4) I, II. Smith

Clinical Program. Prerequisite: courses 210 and 275 recommended. This program offers students the opportunity to assist prisoners of the California Medical Facility at Vacaville with their legal problems, including both civil and criminal matters. Students are engaged throughout the semester interviewing inmates, investigating and evaluating their cases for a minimum of 7 office hours per week. Seminar sessions on prison and parole law are scheduled throughout the semester. The seminars will also include skill development (interviewing, counseling and negotiations) and in the criminal law content, by instruction, filming of simulated sessions and individual critiquing. Limited enrollment. (S/U grading only.)

*485. Street Law (2-3)

Clinical and seminar. Teams of selected students will be assigned to teach a general law course to prisoners in the California Medical Facility at Vacaville, the Sacramento County Jail, and Folsom Prison. There is a wide demand among prisoners for practical knowledge of the law. Thus, the general course will include some criminal law and procedure, family law, housing law, consumer law, and law reform. The seminar will be devoted to the development of the students' teaching, writing, oral advocacy and communications skills and to exploration and discussion of the social and legal problems of inmates. (S/U grading only.)

495. Instruction in Legal Writing and Oral Advocacy Skills (2) I, II. The Staff

Laboratory. Prerequisite: either course 205 plus one semester of 410 or 208A-208B. Each student will plan, present, and oversee a skills program for one small section of course 208A and 208B. Approval of Moot Court Board required for enrollment. May be repeated once for credit. (S/U grading only.)

Faculty

- Ronald A. Arbini, Ph.D., Associate Professor
(*Philosophy*)
Jarvis R. Bastian, Ph.D., Associate Professor
(*Psychology*)
Wilbur A. Benware, Ph.D., Associate Professor
(*German*)
Kent Bimson, Ph.D., Visiting Lecturer (*English*)
Gary L. Cronkhite, Ph.D., Professor (*Rhetoric*)
Linnea C. Ehri, Ph.D., Associate Professor
(*Education*)
*C. James Gallant III, Ph.D., Assistant Professor
(*Russian*)
*Wayne Harsh, Ph.D., Professor (*Linguistics, English*)
Daniel Laferrière, Ph.D., Associate Professor
(*Russian*)
Maria Manoliu-Manea, Ph.D., Professor (*French and Italian*)
Barbara J. Merino, Ph.D., Assistant Professor
(*Education*)
*Richard A. Ogle, Ph.D., Assistant Professor
(*Linguistics*)
David L. Olmsted, Ph.D., Professor
(*Anthropology*)
Winfried Schleiner, Ph.D., Associate Professor
(*English*)
Gwendolyn Schwabe, M.A., Lecturer (*English*)
Janet Shibamoto, Ph.D., Assistant Professor
(*Oriental Languages and Civilizations*)
Susan B. Shimanoff, Ph.D., Assistant Professor
(*Rhetoric*)
Lenora Timm, Ph.D., Associate Professor
(*Linguistics*)
*Máximo Torreblanca, Ph.D., Associate Professor
(*Spanish*)
Carolyn F. Wall, Ph.D., Associate Professor
(*Anthropology*)
Benjamin E. Wallacker, Ph.D., Professor (*Oriental Languages and Civilizations*)

The Major Program

The discipline of linguistics encompasses a broad spectrum of knowledge about human language. Linguistics focuses on the 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 major is designed to familiarize students with the methods of linguistic analysis at gradually accelerated levels of methodological and theoretical complexity through a sequence of "core" courses. Elective courses allow the student to explore areas which overlap linguistics.

Linguistics

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24-34
Linguistics 1 or 135	4
Foreign language, 20 units of Greek or Latin; or 22 units of any other language; or 30 units of two different languages	20-30
Depth Subject Matter	40
Linguistics 109, 110, 139, 140	16
Linguistics 111 or 165	4
Linguistics 102 or 112	4
Oriental Languages and Civilizations 100 or Anthropology 220 (see page 95 for procedures governing undergraduate enrollment in a graduate course)	4

At least 12 upper division units from the following courses:

- Anthropology 118, 120; Education 117B;
English 105A, 105B; French 159,
160; Human Development 101;
Italian 150; Linguistics 135 (if not
used as an alternate to course 1
above), any other linguistics course
not included in the 24-unit
requirement above; Philosophy 137;
Psychology 132, 180G; Rhetoric 105,
180; Russian 160; Spanish 131, 132,
133

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 **64-74**

Major Advisers. W.A. Benware, L. Timm, C.F. Wall.

Minor Program Requirements:

The minor in Linguistics is designed to provide the student with a basic knowledge of linguistic analysis. It would be especially appropriate for students interested in any aspect of language use.

	UNITS
Linguistics	24
Linguistics 1, 109, 110 or 139, and 140	16
Additional units of upper division Linguistics courses, chosen in consultation with an adviser	8

Minor Advisers. Same as Major advisers.

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 Advisers. R.A. Ogle, D.L. Olmsted, L. Timm.

Courses in Linguistics

Lower Division Courses

1. Introduction to Linguistics (4) I, II, III. Ogle, Timm, Benware, Wallacker
Lecture—3 hours; laboratory—1 hour. Introduction to the study of language; its nature, diversity, and structure.

Upper Division Courses

102. Historical Linguistics (4) II. Benware
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 109. Description and methods of the historical study of language; sound change, morphological change, syntactic change, semantic change. Offered in odd-numbered years, alternating with course 202.

105. German Phonology-Morphology (4) III. Benware
Discussion—3 hours; written or oral report. Prerequisite: German 4; course 1 recommended. Modern German phonetics and the structure of the phonological system. Elementary morphological analysis. Offered in odd-numbered years.

106. History of the German Language (4) III. Benware
Discussion—3 hours; written reports. Prerequisite: course 1 or German 105 recommended. Survey of the development of the German language and study of its structure in historical perspective. Offered in even-numbered years. (Same course as German 106.)

107. Special Topics in English Language (4) I. Schleiner, Harsh, Bimson
Seminar—3 hours; special project. Prerequisite: one course from English 1, 2, 3, 4A, 4B. Investigation of varied subjects in contemporary and historical English language studies. May be repeated for credit when a different topic is studied. (Same course as English 107.)

109. Phonetics (4) I. Wall
Lecture—3 hours; discussion—1 hour. Thorough grounding in articulatory phonetics with some attention to the fundamentals of acoustic phonetics. (Same course as Anthropology 109.)

Linguistics

(College of Letters and Science)

Lenora Timm, Ph.D., Program Director
Program Office, 912 Sproul Hall, 752-1219

Committee in Charge

- Wilbur A. Benware, Ph.D. (*German*), Committee
Chairperson
Maria Manoliu-Manea, Ph.D. (*French and Italian*)
*Richard A. Ogle, Ph.D. (*Linguistics*),
Winter-Spring Quarters
Susan B. Shimanoff, Ph.D. (*Rhetoric*)
*Máximo Torreblanca, Ph.D. (*Spanish*)
Lenora Timm, Ph.D. (*Linguistics*)
Edward J. Tully, Jr. (*Mathematics*)

NOTE: For key to footnote symbols, see page 130.

Literature in Translation

110. Elementary Linguistic Analysis (4) II. Olmsted, Shibamoto
Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. An introduction to phonemic theory, morphophonemics, morphemics, and tactics. (Same course as Anthropology 110.)

111. Intermediate Linguistic Analysis (4) III. Olmsted
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Continuation of course 110. More advanced work in phonemics, morphophonemics, morphemics, and tactics. (Same course as Anthropology 111.)

112. Comparative Linguistics (4) I, Olmsted
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Linguistic prehistory, historical linguistics, and reconstruction. (Same course as Anthropology 112.)

113. Language and Sex (4) III. Timm
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 recommended. 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.

***114. The Ethnography of Speaking** (4) I, Timm, Wall
Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 2; Anthropology 4 or course 1. The social and linguistic aspects of verbal behavior. Participants, situations, and functions of communication. Speech communities, language and social stratification, bi- and multilingualism. (Same course as Anthropology 114.)

115. Chicano Sociolinguistics (3) II. Timm
Lecture—3 hours. Prerequisite: course 1 and Spanish 3 or the equivalent. Study of the varieties of Chicano Spanish spoken in the Southwest. Patterns of Spanish-English bilingualism; attitudes about Spanish and English; Chicano Spanish and the schools.

120. Semantics (4) II. Gallant, Manea
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1, or consent of instructor. Introduction to the study of meaning: the nature of the linguistic sign, the structure of the lexicon, and the semantics of sentences. Offered in odd-numbered years.

***135. Perspectives on Linguistic Research** (4) II. Timm
Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: upper division or graduate standing plus familiarity with at least one language other than English. An overview of the field of linguistics and its relation to allied disciplines. Techniques of linguistic analysis will be presented and applied to natural languages. (Only 2 units of credit will be granted to students who have taken course 1.)

138. Language Development (4) II. Wall
Lecture—3 hours; discussion—1 hour. Prerequisite: course 111. 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. Bimson
Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. Introduction to and application of phonological theory.

140. Grammatical Analysis (4) I, Ogle
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. 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.

***146. The Indo-European Languages** (4) II. Benware
Lecture—3 hours; discussion—1 hour. Prerequisite: course 112 recommended. Introduction to the study of the Indo-European language family and its major grammatical features. Reconstruction of Proto-Indo-European.

150. Contrastive Analysis of Spanish and English (4) III. Torreblanca, Timm
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 and Spanish 3 or the equivalent. Comparison of the linguistic structures (phonology, morphology and syntax) of Spanish and English; learning problems of both native Spanish and native English speakers will be considered.

165. Introduction to Generative Grammar (4) II, Ogle
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 140. Introduction to the theory of generative grammar, formalization; goals of linguistic theory; linguistic universals; word and sentence structure, relations between syntax and semantics.

***196. Stylistics** (4) II. Harsh, Bimson
Seminar—3 hours; term paper. Prerequisite: English 105A. Analysis of linguistic stylistic variations in specific works to be selected from the corpus of writings in English. (Same course as English 196.)

197. Tutoring in Linguistics (1-4) I, II, III. The Staff (Chairperson in charge)
Prerequisite: upper division standing with Linguistics major 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) 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 (Timm in charge)
(P/NP grading only.)

Graduate Courses

***200. Gothic** (4) I, Benware
Seminar—3 hours. Knowledge of Modern German not required. Phonology, grammar and reading of Gothic texts. Special topics including the relationship of Gothic to Indo-European and to the other Germanic languages. Offered in even-numbered years. (Same course as German 200.)

202. Principles of Historical Linguistics (4) II. Benware, Manea
Seminar—3 hours. Prerequisite: course 102 or 112. Advanced treatment of the theory and methods of historical linguistics. Offered in odd-numbered years.

205. History of the German Language (4) I, Benware
Seminar—3 hours. The development of the German language with emphasis on the early periods, from Indo-European to Middle High German. (Same course as German 205.)

***215. Computational Linguistics** (2) III. The Staff
Lecture—2 hours. Prerequisite: consent of instructor. The use of electronic computers and other computational devices in linguistic analysis, mechanical translation, and lexicography.

***220. Romance Linguistics** (4) I, Manea
Seminar—3 hours. Prerequisite: one course from the following: courses 112, 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.

225. Modern Linguistic Theory (4) III. Ogle
Seminar—3 hours. Prerequisite: courses 165 and 140. Survey of leading contributions to linguistic theory from de Saussure to the present.

250A-D. Topics in Linguistic Theory and Methods (4) I. The Staff
Seminar—3 hours; paper. Prerequisite: graduate standing and consent of instructor. Introduction to current research in various aspects of linguistics.

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 (Timm in charge)
(S/U grading only)

Professional Course

300. The Teaching of English as a Foreign Language (4) I, Schwabe
Lecture—3 hours; laboratory—3 hours. Prerequisite: English 105A or course 109. Methods of teaching English to nonnative speakers, stressing particularly recent linguistic methodology and techniques.

Classics

- 40. Homer and the Tradition of Ancient Epic
- 41. Greek Tragedy
- *139B. Greek Literature in Translation
- *141. Greek and Roman Comedy
- *142. Greek and Roman Novel

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. The Short Story and Novella
- 5. Fairy Tales, Fables and Parables
- 6. Myths and Legends
- 7. Literature of Fantasy and the Supernatural
- 8. Utopias and their Transformations
- 10A-N. Masterpieces of World Literature
- 13. Dramatic Literature
- *15. The Spiritual Quest
- *20. Man and the Natural World
- *40. Introduction to Comparative Literature
- *49. Freshman Seminar: General Topics in Comparative Literature
- 135. Women Writers
- *159A-G. Special Topics in Comparative Literature
- 160A. The Modern Novel
- 160B. The Modern Drama
- *161A. Tragedy
- *161B. Comedy
- *161C. Tragicomedy
- *162. The Theory and Practice of Literary Translation
- 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-C. Modern Literary Movements and Styles
- *169. The Avant-Garde

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

- *170A. The Epic
- 171. English Bible as Literature

French

- 25. French Literature in Translation
- *150. Masterpieces of French Literature

German

- 49. Freshman Seminar
- 50. Survey of German Culture
- 51. Masterworks of German Literature I
- 52. Masterworks of German Literature II
- 110. Older German Literature
- 111. Studies in Major Writers from the Seventeenth to the Twentieth Century
- 112. Special Topics in German Literature
- 113. Goethe's *Faust*
- 114. Hermann Hesse
- 115A. German Literature since 1945
- 115B. German Literature since 1945
- 116. Intellectual Backgrounds of German Literature

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.

Italian

- 25. Italian Literature in Translation
- *139A. Italian Literature in English: Early Italian Literature and Dante Alighieri
- *139B. Italian Literature in English: Boccaccio, Petrarch and the Renaissance
- *139C. Italian Literature in English: Modern Italian Literature

Russian

- 30. Great Russian Writers
- 41. Survey of Nineteenth-Century Russian Literature
- 42. Survey of Twentieth-Century Russian Literature
- 121. Nineteenth-Century Russian Prose
- 123. Twentieth-Century Russian Prose
- 126. The Russian Theater
- 128. Twentieth-Century Russian Poetry
- 140. Dostoevsky
- 141. Tolstoy
- 150. Russian Culture
- 154. Russian Folklore

Scandinavian

- 110. Masterworks of Scandinavian Literature in Translation

Spanish

- 34. Mexico in Its Literature
- 35. Survey of Mexican Culture
- 50A. Hispanic Literary Heritage
- 50B. Hispanic Literary Heritage
- 149. Order and Chaos: Latin-American Literature in Translation
- 150. Masterpieces of Spanish Literature

Mass Communication

(College of Letters and Science)

Program Office, 912 Sproul Hall (752-1219)

Committee in Charge

- Harvey Himelfarb, M.A. (*Art*), Committee Chairperson
- Joan C. Carr, Ph.D. (*English*)
- Everard d'Harnoncourt, Ph.D. (*Dramatic Art*)
- Jay Mechling, Ph.D. (*American Studies*)
- John R. Owens, Ph.D. (*Political Science*)
- Ralph S. Pomeroy, Ph.D. (*Rhetoric*)
- Howard J. Weiner, Ph.D. (*Mathematics*)

The Major Program

This major is designed to acquaint the student with the general processes, content, and effects of the mass media. The program is not designed to provide specialized technical training. Rather, it is intended to introduce the student to the study of the nature, values, and functions of mass communication in our society and to encourage the student to integrate theoretical concepts, research findings, and critical insights from both social science and humanistic disciplines into a basic understanding of mass media. The major prepares students for graduate study in mass communication or journalism, for advanced professional training, and for careers requiring a coherent understanding of

mass communication. Possible careers include advertising, public relations, news, and management of media outlets.

Mass Communication

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	
There are no lower division requirements for the major. Students should plan to take those courses needed to satisfy prerequisites for upper division requirements in the major program.	
Depth Subject Matter	43-45
At least 36 upper-division units, selected in consultation with a major adviser, to include four courses from one of the <i>a to e</i> topic areas shown below, and five courses distributed among two or more of the remaining areas. (At least 16 of the 36 units must be in residence)	
Rhetoric 190 (to be taken in the junior year in preparation for senior project; may <i>not</i> be taken concurrently with work on senior project)	2
Senior project (see below), Mass Communication 191	5
Total Units for the Major	43-45

Topic Areas

- (a) *Communication Theory*
Required: at least one course from Psychology 145; Rhetoric 100, 114, 130. Additional courses: Anthropology 120; Linguistics 114; Psychology 132; Rhetoric 105, 123.
- (b) *Social and Political Influences on the Mass Media*
Required: at least one course from Political Science 165; Rhetoric 140. Additional courses: American Studies 140A, 140B; History 174B, 176B, 176C; Linguistics 113; Political Science 156, 157A, 164; Rhetoric 122; Sociology 148.
- (c) *Social Science Research Methods*
Philosophy 109; Political Science 111; Psychology 103; Rhetoric 153; Sociology 106.
- (d) *Production of Media Content*
Art 110 or 111, 115, one course from 125, 126, 127, 128, or 129; Dramatic Art 124A or 124B or 124C, 127A, 160A; English 100F or 100P, 103A-F, 184, 186.
- (e) *Analysis of the content and Effects of Mass Communication*
Art 147, 148; Dramatic Art 115; English 183; English 105A; Philosophy 123; Rhetoric 141; Sociology 175.

Note: With approval from the Mass Communication Curriculum (MCC) Committee, certain courses not listed above may be used to satisfy upper division area requirements.

Student's Program. A prospective or declared Mass Communication major should submit a proposed program of upper division courses, prepared in consultation with a major adviser, to the MCC Committee for approval no later than the first quarter of the junior year. Prospective Mass Communication majors transferring into the College as upper division students should consult with an adviser immediately upon arrival.

Senior Project. A project proposal requiring approval by the majority of the Mass Communication Curriculum Committee precedes the senior project. Once the proposal has been approved, the student enrolls for Mass Communication 191. A paper is required substantiating the relation of the project to mass communication and containing a report and critical analysis of the process by which the project was created. If the project itself is a paper, as in the case of a library research paper or a report of an experiment or survey, that paper

should incorporate sections substantiating the relationship to mass communication and critically analyzing the research process. If the project is a creative activity producing some artifact, that artifact must be accompanied by a separate paper in order to fulfill this requirement.

The project must be original work conceived, designed, and executed in consultation with a faculty adviser for the specific purpose of meeting the senior project requirement. Since it becomes the legal property of the Regents of the University it should not have been produced for any other purpose or previously submitted to any other agency except as approved by the Curriculum Committee and it should be unencumbered as to copyright at the time of its submission. (At the request of the student it may, of course, be released for publication or other public use after its acceptance by the Committee.)

The project may entail research answering some question or supporting some thesis regarding mass communication content, policy, or effects. For example, it may consist of a report of library research, an experiment, a survey, or a content analysis, or it may consist of a critical analysis of some communication event, process, or campaign. It may involve some form of creative activity which culminates in some artifact such as a film, audio or video tape, slide show, script, graphic design, a coordinated and perhaps multi-media persuasive or informational campaign, or some journalistic production such as a portfolio of editorials, news reports, or critical columns.

The completed project must be submitted for final approval in the quarter preceding the one in which the student plans to graduate (except for September graduates, who must submit their projects in the preceding winter quarter). Final approval requires a favorable evaluation of the completed project by two members of the Curriculum Committee assigned to the project by the Chairperson. If the two assigned members fail to agree, the project will be reviewed and the final decision made by a quorum of the entire Committee.

Both the proposal and the project must be submitted to the Curriculum Committee through the Mass Communication Office in 912 Sproul Hall.

Further information is contained in a booklet entitled "Rationale and Procedure for Mass Communication Senior Projects," available in the Mass Communication Office.

Major Advisers. Members of the Committee.

Courses in Mass Communication

Upper Division Courses

- 191. Senior Project** (5) I, II, III. The Staff (Committee Chairperson in charge)
Prerequisite: Rhetoric 190 and prior approval of senior project prospectus; upper division standing and declared major in Mass Communication or consent of instructor. Directed execution of research study or creative project previously approved by Mass Communication Curriculum Committee. Credit will be granted and "P" grade recorded only upon approval of Curriculum Committee of the completed project. Required for Mass Communication majors. (P/NP grading only.)
- 192. Internship in Mass Communication** (3-5) I, II, III. The Staff (Committee Chairperson in charge)
Work-learn experience—9-15 hours. Prerequisite: completion of a minimum of 84 units; consent of instructor. Work-research project completed under Curriculum Committee supervision. Satisfactory completion of written report of project and satisfactory recommendation from on-site supervisor. (P/NP grading only.)
- 198. Directed Group Study** (1-5) I, II, III. The Staff (Committee Chairperson in charge)
Seminar—1-5 hours. Prerequisite: upper division standing and consent of instructor. Group study of a topic or set of phenomena relevant to mass communication under the direction of a faculty member in mass communication. (P/NP grading only.)

NOTE: For key to footnote symbols, see page 130

Mathematics

199. Directed Independent Study (1-5) I, II, III. The Staff (Committee Chairperson in charge)
Prerequisite: upper division standing and consent of instructor. Independent study of a topic or set of phenomena relevant to mass communication under the direction of a faculty member in mass communication. Credit to be granted for completion of course of study negotiated with instructor under supervision of Curriculum Committee. (P/NP grading only.)

Mathematics

(College of Letters and Science)

Carlos R. Borges, Ph.D., Chairperson of the Department

G. Thomas Sallee, Ph.D., Vice-Chairperson of the Department

Department Office, 565 Kerr Hall (752-0827)

Faculty

Henry L. Alder, Ph.D., Professor

Hubert A. Arnold, Ph.D., Associate Professor Emeritus

George A. Baker, Ph.D., Professor Emeritus

^{2,3}Dallas O. Banks, Ph.D., Professor

⁴David W. Barnette, Ph.D., Professor

^{3,4}Donald C. Benson, Ph.D., Professor

Carlos R. Borges, Ph.D., Professor

Robert J. Buck, Ph.D., Associate Professor

Albert C. Burdette, Ph.D., Professor Emeritus

Gulbank D. Chakerian, Ph.D., Professor

Doyle O. Cutler, Ph.D., Associate Professor

James R. Diederich, Ph.D., Associate Professor

¹Allan L. Edelson, Ph.D., Associate Professor

Curtis M. Fulton, Ph.D., Professor Emeritus

Robert D. Glauz, Ph.D., Professor

Shirley A. Goldman, M.S., Lecturer

Alan M. Hastings, Ph.D., Assistant Professor

Charles A. Hayes, Jr., Ph.D., Professor Emeritus

Frederick A. Howes, Ph.D., Assistant Professor

Kenneth I. Joy, Ph.D., Assistant Professor

Kurt Kreith, Ph.D., Professor

¹Arthur J. Krener, Ph.D., Professor

Meiven R. Krom, Ph.D., Professor

²Gary J. Kurowski, Ph.D., Professor

Peter Linz, Ph.D., Professor

Marc S. Mangel, Ph.D., Assistant Professor

^{3,4}David G. Mead, Ph.D., Professor

E. O. Milton, Ph.D., Associate Professor

Donald A. Norton, Ph.D., Associate Professor

^{2,3}Washek F. Pfeffer, Ph.D., Professor

²Richard E. Plant, Ph.D., Associate Professor

Edward B. Roessler, Ph.D., Professor Emeritus

G. Thomas Sallee, Ph.D., Professor

Evelyn M. Silvia, Ph.D., Associate Professor

²Sherman K. Stein, Litt.D. (hon.), Ph.D., Professor

Robert W. Stringall, Ph.D., Associate Professor

Takayuki Tamura, D.Sc., Professor

Edward J. Tully, Jr., Ph.D., Associate Professor

Howard J. Weiner, Ph.D., Professor

The Major Program

Students majoring in mathematics may follow a program leading to either the Bachelor of Arts or the Bachelor of Science degree. The latter is especially recommended for students who intend to pursue mathematics at the graduate level. Under either degree program the student may prepare for various careers by an appropriate choice of elective courses.

Developing an ability to think and communicate in mathematical terms is the basic objective of both bachelors degree programs. This ability requires familiarity with the concepts and techniques of various branches of mathematics and is necessary for graduate study in mathematics as well as the successful pursuit of mathematically oriented

careers. In particular, mathematics is an essential tool for people working in the physical sciences, and mathematics is now being widely applied to studies in the biological and social sciences as well. Students with career oriented programs in applied mathematics should supplement their mathematics curriculum with courses in other departments which provide background in their proposed area of application.

Mathematics

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24-26
Mathematics 11 (or high school equivalent)	0-2
Mathematics 21A, 21B, 21C, 22A, 22B, 22C, 29	24
Depth Subject Matter	36
Mathematics 101, 108A (should be taken before junior year)	5
Additional upper division units in Mathematics	31
Total Units for the Major	60-62

Mathematics

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	24-26
Mathematics 11 (or high school equivalent)	0-2
Mathematics 21A, 21B, 21C, 22A, 22B, 22C, 29	24
Depth Subject Matter	45
Mathematics 101, 108A (should be taken before the junior year)	5
Additional upper division units in Mathematics	40
Total Units for the Major	69-71

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, 197TC, 198, and 199 courses are not appropriate to be applied towards this requirement, any exceptions must be approved by the Department's committee on program review.

Statement of Objectives. During the last quarter of the sophomore year each prospective mathematics major should, in consultation with an adviser, prepare a statement of his or her mathematical objectives and a proposed upper division program consistent with those objectives. 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, G. D. Chakerian, G. J. Kurowski, P. Linz, R. E. Plant, S. K. Stein.

Information for Undergraduates. Students interested in the study of mathematics should obtain the Undergraduate Brochure, which is available at the Department Office. 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.

Prerequisite Credit. Credit will not normally be given for a course if it is prerequisite to a course already successfully completed. Exceptions can only be made by the Department Chairperson.

Applied Mathematics. Recommended career preparation: Most programs include Mathematics 19 or 29, 118A, 118B, 120, 121A, 121B, 128A, 128B, 128C and 167. Applied mathematics has many possible areas of specialization; see the special subject matter advisers for emphasis in applied analysis, biological science, computer science, social science and systems theory.

Computer Science. Recommended preparation for a career or graduate study in Computer Science should include: Mathematics 29, 124, 128A, 128B, 128C, 129A, 129B, 129C, 139A, and 167. Contact P. Linz, special adviser for Computer Science, for more information.

Minor Program Requirements:

	UNITS
Mathematics	20
Upper division units in mathematics (exclusive of Mathematics 101, 192, 197TC, 198, 199)	20
Three of these units could be from either Mathematics 36 or 37.	

Special Area Advisers. F. A. Howes, (Applied Analysis), R. E. Plant (Biological Science), P. Linz (Computer Science), H. J. Weiner (Probability), K. Kreith (Social Science, Minor Program), A. J. Krener (Systems Theory).

Graduate Study in Pure Mathematics. Recommended preparation; Mathematics 127A, 127B, 127C, and 151A, 151B, 151C. Students are free to take additional courses reflecting their special interests with the approval of their adviser.

Secondary Teaching in Mathematics. Recommended preparation: Mathematics 108A, 139A, 139B, 141, and 167 are essential; a selection from courses 19 (or 29), 36, 37, 112, 114, 115A, 128A is highly recommended.

Teaching Credential Subject Representative. G. T. Sallee. See page 105 for the 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 Adviser, Department of Mathematics.

Graduate Advisers. D. W. Barnette, F. A. Howes, A. J. Krener, P. Linz, G. T. Sallee.

Courses in Mathematics

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. (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. (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 equation. Offered only if sufficient number of students enroll. (P/NP grading only.) (There is a fee of \$15.)

10. Mathematics and Civilization (4) II. Kreith
 Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra and geometry. Historical account of role of mathematics in western civilization. Discussion of contemporary attempts to extend realm of mathematics beyond its established role as language of physical sciences and into human affairs. Course will include problem solving in areas covered.

- 11. Analytic Geometry (2) I, II, III.** The Staff
Lecture—2 hours. Prerequisite: two years high school algebra, plane geometry, plane trigonometry. Analytic geometry in two dimensions.
- 15. Introduction to Matrix Theory and Linear Programming (3) I, II.** The Staff
Lecture—3 hours. Introduction to matrices, determinants and linear programming. Not open for credit to students who have received credit for course 22A. Not recommended for students who wish to major in the mathematical sciences.
- 16A. Analytic Geometry and Calculus (3) I, II, III.** The Staff
Lecture—3 hours. Prerequisite: one and one-half years of high school algebra, plane geometry, plane trigonometry. Not open for credit to students who have received credit for course 21A. A short course in analytic geometry and differential and integral calculus. Not recommended for students who wish to major in the mathematical sciences.
- 16B. Analytic Geometry and Calculus (3) I, II, III.** The Staff
Lecture—3 hours. Prerequisite: course 16A or 21A. Not open for credit to students who have received credit for course 21B. Continuation of course 16A.
- 16C. Analytic Geometry and Calculus (3) I, II, III.** The Staff
Lecture—3 hours. Prerequisite: course 16B or 21B. Not open to students who have received credit for course 21C. Continuation of course 16B.
- 19. Basic Concepts of Computing (3) I, II, III.** The Staff
Lecture—2 hours; laboratory—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. Course not intended for students in physical sciences and mathematics. Students having had course 29 or Engineering 5 may not receive credit for this course.
- 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 (if analytic geometry has not been completed, course 11 may be taken concurrently). Only two units of credit will be allowed to students who have credit for course 16A. Functions, limits, continuity. Slope and derivative. Differentiation of algebraic and transcendental functions. Applications to motion, natural growth, graphing, extrema of a function. Differentials. L'Hôpital's rule.
- 21AH. Honora Calculus (4) I.** The Staff
Lecture—4 hours. More intensive treatment of material covered in course 21A. Students completing 21AH can continue with course 21BH or the regular 21B.
- 21B. Calculus (4) I, II, III.** The Staff
Lecture-discussion—4 hours. Prerequisite: course 21A or 21AH. Only two units of credit will be allowed students who have received credit for course 16B. 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.
- 21BH. Honora Calculus (4) II.** The Staff
Lecture—4 hours. More intensive treatment of material covered in course 21B. Students completing 21BH can continue with course 21CH or the regular 21C.
- 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. More intensive treatment of material covered in course 21C.
- 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. (Courses 22A, 22B, 22C may be taken in any order. However, if enrolled in Physics 8 sequence, 8B-8C-8D, courses should be taken in reverse order, 22C, 22B, 22A.)
- 22AH. Honors Linear Algebra (3) III.** The Staff
Lecture—3 hours. Prerequisite: course 22BH or consent of instructor. More intensive treatment of material covered in course 22A.
- 22B. Differential Equations (3) I, II, III.** The Staff
Lecture—3 hours. Prerequisite: course 21C. Solutions of elementary differential equations.
- 22BH. Honors Differential Equations (3) II.** The Staff
Lecture—3 hours. Prerequisite: course 22CH or consent of instructor. More intensive treatment of material covered in course 22B.
- 22C. Vector Analysis (3) I, II, III.** The Staff
Lecture—3 hours. Prerequisite: course 21C. Vector algebra, vector calculus. Scalar and vector fields. Line and surface integrals. Green's theorem, Stokes' theorem, divergence theorem.
- 22CH. Honors Vector Analysis (3) I.** The Staff
Lecture—3 hours. Prerequisite: course 21C or consent of instructor. More intensive treatment of material covered in course 22C.
- 29. Introduction to Computer Science (3) I.** The Staff
Lecture—2 hours; laboratory—2 hours. Prerequisite: course 21C. Introduction to properties of a digital computer. Implementation of mathematical algorithms on a computer. Students electing this course may not receive credit for Engineering 5 and only two units of credit will be allowed for students who have had course 19.
- 36. Fundamentals of Mathematics (3) I, II, III.** The Staff
Lecture—3 hours. 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.
- 37. Topics in Geometry (3) III.** The Staff
Lecture—3 hours. Prerequisite: one year high school geometry. Topics in Euclidean geometry selected from the theory of geometric transformations, the area and dissection of plane figures, convex polyhedra, foundations of geometry.
- 71A. Elementary Mathematics and Its Instruction (4) II.** The Staff
Lecture—2 hours; field work—6 hours. Introduction to the mathematics underlying the content and methods of instruction in grades K-8. Enrollment requires concurrent placement as a teacher-aid. (Deferred grading only, pending completion of course 71A-71B sequence.)
- 71B. Elementary Mathematics and Its Instruction (3) III.** The Staff
Lecture—3 hours. Prerequisite: course 71A; Education 100 (must be taken concurrently). Continuation of course 71A. (Deferred grading only, pending completion of course 71A-71B sequence.)
- 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

- 101. Survey of Contemporary Mathematics (2) II.** The Staff
Lecture—2 hours. Prerequisite: course 21C. An introduction to modern mathematics, its methods and applications, including the relationship between pure and applied mathematics. (P/NP grading only.)
- 108A. Introduction to Abstract Algebra and Analysis (3) I, III.** The Staff
Lecture—3 hours. Prerequisite: course 21C. Introduction to abstract mathematics, including the real number system, sets, mappings, mathematical induction, and algebraic structures.
- *112. Projective Geometry (3) I.** The Staff
Lecture—3 hours. Prerequisite: course 108A. Analytic and synthetic methods applied to topics chosen from the following: perspectivities, projectivities, harmonic sets, involutions and conics. Offered in odd-numbered years.
- *114. The Theory of Convex Sets (3) III.** The Staff
Lecture—3 hours. Prerequisite: courses 21C, 22A, 108A; or consent of instructor. Topics selected from the theory of convex bodies, convex functions, geometric inequalities, combinatorial geometry, and integral geometry. Offered in even-numbered years.
- 115A. The Theory of Numbers (3) I, Alder**
Lecture—3 hours. Prerequisite: course 108A. 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 108A. Euler function, Moebius function, congruences, primitive roots, quadratic reciprocity law. Offered in even-numbered years.
- *115C. The Theory of Numbers (3) III, Alder**
Lecture—3 hours. Prerequisite: course 108A. Continued fractions, partitions. Offered in even-numbered years.
- 116. Metric Differential Geometry (3) III.** The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22C; or consent of instructor. Vector analysis, curves and surfaces in three dimensions. Offered in odd-numbered years.
- 118A. Partial Differential Equations: Elementary Methods of Solution (3) II.** The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22B, 22C. Partial differential equations of mathematical physics, solution by separation of variables. Fourier series.
- 118B. Partial Differential Equations: Boundary Value Problems and Special Functions (3) III.** The Staff
Lecture—3 hours. Prerequisite: course 118A. Classical boundary value problems, expansion by orthogonal functions, Sturm-Liouville theory, special functions.
- 119. Theory of Ordinary Differential Equations (3) I.** The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22B, 22C. Existence and uniqueness of solutions of ordinary differential equations, matrix solutions of linear systems, linearization of nonlinear equations, local behavior near a critical point and stability theory.
- 120. Complex Variables and Applications (3) III.** The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22B, 22C. Analysis of functions of one complex variable, Laplace transforms, and applications.
- 121A-121B. Advanced Calculus for the Sciences (3-3) I-II.** The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22B, 22C. Multidimensional calculus, Fourier series, calculus of variations, special functions, distributions, integral transforms, estimation and inequalities. Intended primarily for students majoring in science, engineering, and applied mathematics. Not open without consent of instructor to students who have received credit for course 127.
- 124. Introduction to Minicomputers (3) II, Glauz**
Lecture—2 hours; laboratory—1 hour; laboratory projects. Prerequisite: courses 19 or 29 or Engineering 5, or the equivalent. Basic study of use, programming, and applications of minicomputers. Operating system, utilities, assembly language, computer organization.
- *125. Introduction to Mathematical Logic (3) I, Krom**
Lecture—3 hours. Prerequisite: course 108A. Propositional calculus, predicate calculus, normal forms, completeness. Offered in odd-numbered years.
- 126. Introduction to the Theory of Sets (3) II.** The Staff
Lecture—3 hours. Prerequisite: course 21C or consent of instructor. Fundamental concepts including cardinal numbers, order types, ordinal numbers. Offered in odd-numbered years.
- 127A-127B-127C. Advanced Calculus (4-4-4) I-II-III.** The Staff
Lecture—3 hours; extensive reading and problem solving. Prerequisite: courses 22A, 22C; course 108A (may be taken concurrently with consent of instructor). 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; discussion—1 hour. Prerequisite: course 29 or a knowledge of FORTRAN or ALGOL. Error analysis, approximation, interpolation, numerical differentiation and integration.
- 128B. Numerical Analysis in Solution of Equations (4) II.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 22A, and 29 or knowledge of FORTRAN or ALGOL. Solution of nonlinear equations and nonlinear systems. Minimization of functions of several variables. Simultaneous linear equations. Eigenvalue problems. Linear programming.
- 128C. Numerical Analysis in Differential Equations (4) III.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 22A, 22B and 128A. Difference equations, operators, numerical solution of differential equations, partial differential equations.
- 129A. Mathematical Aspects of Computer Systems (4) I.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 22A and 29 or the equivalent. Mathematical topics relating to computer design, number representation, computer arithmetic, Boolean algebra.
- 129B. Mathematical Aspects of Computer Programming (4) II.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 129A or consent of instructor. Programming techniques and efficiency, data structures, graphs, trees, relevance of data structures to problem solving, analysis of algorithms.
- 129C. Automata Theory and Formal Languages (4) III.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 129B or consent of instructor. Automata theory, Turing machines, formal languages and grammars. Discussion of formal aspects of ALGOL. Parsing of grammars.

NOTE: For key to footnote symbols, see page 130.

131. Methods of Mathematical Probability (4) I. The Staff
Lecture—4 hours. Prerequisite: course 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 had Statistics 131A may not receive credit for this course.

132A-132B. Introduction to Stochastic Processes (3-3) II-III. The Staff
Lecture—3 hours. Prerequisite: course 131 (or Statistics 131A). Random walks, recurrent events, Markov chains, birth-and-death processes.

133. Probabilistic Models in Operations Research (3) III. The Staff
Lecture—3 hours. Prerequisite: course 132A. Applications of probability to the study of biological and social systems. Topics include the Poisson process, reliability, queueing, inventory models, Markov chains and processes, diffusion processes. Offered in odd-numbered years.

136. Development of Mathematical Ideas (3) II. Kreith
Lecture—3 hours. Prerequisite: course 21C. Topics and mathematicians studied with an emphasis on the origin of modern mathematics. May be repeated for credit with consent of instructor.

139A. Introduction to Algebra (3) I. The Staff
Lecture—3 hours. Prerequisite: courses 22A and 108A or consent of instructor. Introduction to the theory and applications of groups, rings, and fields. Not open to students who have received credit or are currently enrolled in course 151A without consent of Department Chairperson.

139B. Introduction to Algebra (3) II. The Staff
Lecture—3 hours. Prerequisite: course 139A. Continuation of course 139A.

140. Applications of Mathematics (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 22A and 22B. Applications of mathematics in physical, biological and social sciences. Formulation, analysis and interpretation of mathematical models.

141. Euclidean Geometry (3) II. The Staff
Lecture—3 hours. Prerequisite: course 108A. An axiomatic and analytic examination of Euclidean geometry from an advanced point of view. In particular, a discussion of its relation to other geometries.

143. Biomathematics (3) II. Plant
Lecture—3 hours. Prerequisite: course 16C or 21C. Applications of mathematical techniques in biology and the life sciences. Compartmental analysis, enzyme kinetics, population models, blood flow and neural modelling.

147. Topology (3) II. The Staff
Lecture—3 hours. Prerequisite: course 127C, and 151A or 139A-139B. Basic notions of point-set and combinatorial topology. Offered in even-numbered years.

151A-151B-151C. Algebra (4-4-4) I-II-III. The Staff
Lecture—3 hours; extensive reading and problem solving. Prerequisite: course 108A. Groups, rings, fields and linear transformations. Course emphasizes theory and is recommended for those planning graduate level mathematics.

163A-163B. Time Series (3) II-III. Krener.
Lecture—3 hours. Prerequisite: courses 22A, 22B and 131. Stationary and non-stationary time series and examples. Forecasting. Identification, estimation. Spectral analysis control.

163A-163B. Time Series (3) II-III. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22B and 131. Stationary and non-stationary time series and examples. Forecasting. Identification, estimation. Spectral analysis control.

167. Linear Algebra and Applications (3) II. The Staff
Lecture—3 hours. Prerequisite: one year of calculus or consent of instructor. 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 and Game Theory** (3) III. The Staff
Lecture—3 hours. Prerequisite: one year of calculus, and either course 22A or 167. Linear and nonlinear programming, dynamic programming and game theory. Offered in even-numbered years.

***185A-185B. Functions of a Complex Variable** (3-3) I-II. The Staff
Lecture—3 hours. Prerequisite: course 22C. Complex number systems. Cauchy-Riemann equations, elementary functions. Cauchy integral theorem, power series, Laurent series, residue theorem, conformal mapping, special topics. Offered in odd-numbered years.

192. Internship in Applied Mathematics (1-3) I, II, III. The Staff (Chairperson in charge)
Work-learn experience; final report. Prerequisite: upper division standing; project approval by faculty sponsor prior to enrollment. Supervised work-learn experience in applied mathematics. May be repeated for credit for a total of 10 units. (P/NP grading only.)

197C. 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. Real Analysis (3-3-3) I-II-III. The Staff
Lecture — 3 hours. Prerequisite: course 127C. Point set topology; Lebesgue measure and integration on the real line; abstract spaces; general measure and integration.

***202A-202B-202C. Functional Analysis** (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: courses 127C, 151C, 201C. Hilbert spaces, spectral theorem, Banach spaces, commutative Banach algebras.

205A-205B-205C. Functions of a Complex Variable (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 127C. Theory of analytic functions. Cauchy integral theorem, power series, analytic continuation, conformal mapping, special functions. Offered in even-numbered years.

210A-210B-210C. Topics in Algebra, Analysis and Geometry (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: bachelor's degree in mathematics or consent of instructor. Topics in advanced algebra, analysis, and geometry related to curriculum at all levels. (Course 210A, 210B, 210C series may be repeated for credit with prior consent of instructor.)

213A-213B. Stochastic Differential Equations and Applications (3-3) II-III. Mangel
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Review of probability and simple stochastic processes. Linear stochastic differential equations, methods for solution. Properties of Gauss-Markov processes, applications. Non-linear stochastic differential equations, Ito and Stratonovich calculi, diffusion processes, numerical methods. Theory of boundary conditions. Asymptotic methods for the solution of stochastic differential equations. Filtering, applications. Offered in even-numbered years.

215A-215B-215C. Topology (3-3-3) I-II-III. Borges
Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Topics selected from point-set topology and homotopy theory. Offered in even-numbered years.

218A-218B. Partial Differential Equations (3-3) I-II. Benson
Lecture—3 hours. Prerequisite: courses 22A, 127C. Topics from the theory of partial differential equations and integral equations. Offered in even-numbered years.

***219A-219B. Ordinary Differential Equations** (3-3) I-II. 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 odd-numbered years.

220A-220B-220C. Mathematics for the Physical Sciences (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 118B, and 120 or the equivalent. Topics in ordinary and partial differential equations, boundary value problems, functions of a complex variable, matrices and calculus of variations.

221A-221B. Mathematical Fluid Dynamics (3) I-II. Howes
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 even-numbered years.

222. Numerical Fluid Dynamics (3) III. Plant
Lecture—3 hours. Prerequisite: course 118B or 128C or the equivalent. Derivation of Navier-Stokes and related equations. Basic conventional methods for incompressible flow.

Methods for compressible flow. Computing viscous effects. Flow through porous media. Free boundary problems. Offered in even-numbered years.

225A-225B. Metamathematics (3-3) II-III. Krom
Lecture—3 hours. Prerequisite: course 126 or the equivalent. Axiomatizability, consistency, and completeness of the formalized mathematical theories; definability in formal languages; topics from the theory of models. Offered in odd-numbered years.

***227A-227B-227C. Theoretical Numerical Analysis** (3-3-3) I-II-III. Linz
Lecture—3 hours. Prerequisite: consent of instructor. Introduction to the principles of modern numerical analysis, its terminology and problems, and its relation to other fields of mathematics. Approximation theory, numerical integration, approximate solutions of operator equations, theory of iterative procedures, optimization problems and topics of current interest. Offered in odd-numbered years.

228A-228B-228C. Numerical Solution of Differential Equations (3-3-3) I-II-III. Plant
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 even-numbered years.

***229A-229B-229C. Numerical Methods in Linear Algebra and Selected Topics** (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Computational methods and theoretical aspects of the solution of simultaneous algebraic equations and matrix eigenvalue problems. Numerical analysis in the solution of partial differential equations, optimization, data analysis, Monte Carlo, etc. Offered in odd-numbered years.

235A-235B-235C. Probability Theory (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 127C. Measure-theoretic foundations of probability, distribution functions and characteristic functions, law of large numbers and central limit theorems, conditional probabilities, martingales.

***240A-240B-240C. Differential Geometry** (3-3-3) I-II-III. Chakerian
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 odd-numbered years.

***245A-245B-245C. Algebraic Topology** (3-3-3) I-II-III. Pfeffer
Lecture—3 hours. Prerequisite: course 215C. Algebraic invariants of spaces and their behavior with respect to continuous functions. Offered in odd-numbered years.

***250A-250B-250C. Algebra** (3-3-3) I-II-III. Cutler
Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. The theory of groups, rings, and fields.

251A-251B. Theory of Groups (3-3) I-II. The Staff
Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Normal subgroups, composition series, Sylow subgroups, nilpotent groups, solvable groups, group representations, groups with operators, group extensions, free groups, and ordered groups. Offered in even-numbered years.

***252. Linear Algebra** (3) I, Stein
Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Vector spaces. Offered in even-numbered years.

253. Theory of Binary Systems (3) III. Tamura
Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Elements of semigroups, quasigroups, and groupoids.

270A-270B. Modern Methods of Operations Research (3) II-III. Mangel
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Modelling, scaling, nondimensionalization. Deterministic control theory, nonlinear deterministic differential equations, nonlinear filtering, nonlinear optimization. Decision theory, information theory and applications. Stochastic differential equations, differential games. Offered in odd-numbered years.

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 semigroups, 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 Courses

300A. The Teaching of Mathematics, K-9 (1-1-1) I-II-III; or (3) *II. The Staff

Lecture, discussion, laboratory, and field work—2-6 hours. Prerequisite: senior or graduate standing, simultaneous teaching experience, and sufficient background for successful completion of the mathematics portion of the Commission for Teaching Preparation and Licensing General Subject Matter Examination or its equivalent; or consent of instructor. Mathematics curriculum and teaching methods for grades K-9. Students may complete the course in 1 or 3 quarters. Arrangements for enrollment must be made at the beginning of the Fall Quarter through the Education Department. (Deferred grading only, pending completion of course.)

***300B. The Teaching of Mathematics** (3) I, II, III. The Staff
Lecture, discussion, laboratory and field work—2-6 hours. Prerequisite: consent of instructor or senior or graduate standing; simultaneous teaching experience, and a mathematics minor or the equivalent. Mathematics curriculum and teaching methods. Students may complete the course in 1, 2, or 3 quarters. Students teaching full time who wish to complete 3 units during a single year must enroll during the Fall Quarter. (Deferred grading only, pending completion of course.)

301A-301B-301C. Mathematics Teaching Practicum (3-3-3) I-II-III. The Staff

Laboratory—6 hours. Prerequisite: concurrent enrollment in course sequences 210, 302, and 303 or consent of instructor. Specialist training in mathematics teaching. Required for advanced degrees in mathematics education. Sequence requires a strong undergraduate program in the mathematical sciences and may be repeated once for credit with consent of instructor.

302A-302B-302C. Curriculum Development in Mathematics (1-1-1) I-II-III. The Staff

Lecture—1 hour. Prerequisite: concurrent enrollment in course sequences 210 and 303 or consent of instructor. Mathematics curriculum development for all grade levels. Required for advanced degrees in mathematics education. Course requires a strong undergraduate mathematics program. The sequence may be repeated once for credit with consent of instructor.

303A-303B-303C. Mathematics Pedagogy (1-1-1) I-II-III. The Staff

Lecture—1 hour. Prerequisite: concurrent enrollment in course sequences 210 and 302 or consent of instructor. An investigation of the interplay of mathematical pedagogy and mathematical content, including a historical survey of past and present methods and the influences that shaped their development. The sequence may be repeated once for credit with consent of instructor.

Medical Microbiology

See Medicine

Medicine

School of, this page; Medicine (Veterinary Medicine), see page 255

Medicine

(School of Medicine)

Hibbard E. Williams, M.D., Dean of the School
Ernest M. Gold, M.D., Executive Associate Dean
James J. Castles, M.D., Associate Dean
Guy Corkill, M.D., Associate Dean
Keith F. Killam, Jr., Ph.D., Associate Dean
Don A. Rockwell, M.D., Acting Associate Dean
Thomas Winston, M.H.A., Associate Dean
Frederick W. Hanson, M.D., Assistant Dean
Gary L. Henderson, Ph.D., Assistant Dean
Charles C. Semple, M.B.A., Assistant Dean
Larry G. Stark, Ph.D., Acting Assistant Dean
Dean's Office, Medical Sciences IC (752-0331)

Faculty

Charles F. Abildgaard, M.D., Professor
(*Pediatrics*)
Stephen I. Abramowitz, Ph.D., Associate
Professor in Residence (*Psychiatry*)
Harry G. Adams, M.D., Assistant Professor in
Residence (*Internal Medicine*)
Raymond D. Adelman, M.D., Assistant Professor
(*Pediatrics*)
Charles E. Ahlfors, M.D., Assistant Professor in
Residence (*Pediatrics*)
Ezra A. Amsterdam, M.D., Professor (*Internal
Medicine*)
Arliss L. Anderson, M.H.S., Lecturer (*Family
Practice*)
Neil C. Andrews, M.D., Professor (*Postgraduate
Medicine, Surgery*)
Len Hughes Andrus, M.D., Professor (*Family
Practice*)
Najam Awan, M.D., Assistant Professor in
Residence (*Internal Medicine*)
Paul Bach-y-Rita, M.D., Professor in Residence
(*Physical Medicine and Rehabilitation*)
Thomas Barcia, M.D., Instructor in Residence
(*Radiology*)
William Barron, M.D., Assistant Professor
(*Internal Medicine*)
Alexander Barry, Ph.D., Professor Emeritus
(*Human Anatomy*)
Arthur L. Barry, Ph.D., Professor in Residence
(*Internal Medicine, Pathology*)
James Barter, M.D., Professor (*Psychiatry*)
Randall C. Baselt, Ph.D., Associate Professor
(*Pathology*)
Ronald J. Baskin, Ph.D., Professor (*Physical
Medicine and Rehabilitation*)
Lawrence Bass, M.D., Lecturer (*Dermatology*)
John R. Battista, M.D., Assistant Professor
(*Psychiatry*)
Herbert Bauer, M.D., M.P.H., Lecturer
(*Community Health*)
Blaine L. Beaman, Ph.D., Associate Professor
(*Medical Microbiology*)
Charles J. Beauchamp, M.D., Assistant
Professor (*Pediatrics*)
Joseph P. Belber, M.D., Professor in Residence
(*Internal Medicine*)
William F. Benisek, Ph.D., Associate Professor
(*Biological Chemistry*)
Eliezer Benjamini, Ph.D., Professor (*Medical
Microbiology*)
Daniel R. Benson, M.D., Associate Professor
(*Orthopaedic Surgery*)
Edmund M. Bernauer, Ph.D., Professor (*Physical
Medicine and Rehabilitation*)
Leslie Bernstein, M.D., D.D.S., Professor
(*Otorhinolaryngology*)
Kazuko Bill, M.D., Assistant Professor in
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Kay H. Blacker, M.D., Professor (*Psychiatry*)
F. William Blaisdell, M.D., Professor (*Surgery*)
Hugo G. Bogren, M.D., Professor (*Radiology,
Internal Medicine*)
Robert J. Bolt, M.D., Professor (*Internal
Medicine*)
William J. Bommer, M.D., Assistant Professor
(*Internal Medicine*)
Nemat O. Borhani, M.D., Professor (*Community
Health, Internal Medicine*)
Edwin M. Bradbury, Ph.D., Professor (*Biological
Chemistry*)
James H. Breeden, M.D., Assistant Professor in
Residence (*Internal Medicine*)
Robert V. Broadbent, M.D., Assistant Professor
in Residence (*Radiology*)
James W. Brodrick, Ph.D., Assistant Adjunct
Professor (*Internal Medicine*)
Glen E. Brown, M.D., Lecturer (*Family Practice*)
Thomas C. Brown, Ph.D., Associate Professor in
Residence (*Family Practice*)
Eugene Burbige, M.D., Assistant Professor in
Residence (*Internal Medicine*)
Gary R. Burke, M.D., Assistant Professor
(*Internal Medicine*)
Bill D. Burr, M.D., Associate Professor (*Family
Practice*)
Peter M. Cala, Ph.D., Assistant Professor
(*Human Physiology*)
Robert Cannon, M.D., Assistant Professor in
Residence (*Pediatrics*)
Robert D. Cardiff, M.D., Ph.D., Professor
(*Pathology*)
George H. Cardinet III, D.V.M., Ph.D., Professor
(*Physical Medicine and Rehabilitation*)
Richard C. Carlsen, Ph.D., Assistant Professor
(*Human Physiology*)
Edward C. Carlson, Ph.D., Associate Professor
(*Human Anatomy*)
Marion A. Carnes, M.D., Professor
(*Anesthesiology*)
Anthony V. Carrano, Ph.D., Assistant Adjunct
Professor (*Radiology*)
Stanley N. Carson, M.D., Assistant Professor in
Residence (*Surgery*)
James J. Castles, Jr., M.D., Professor (*Internal
Medicine*)
Willard R. Centerwall, M.D., Professor in
Residence (*Pediatrics*)
Robert S. Chang, M.D., D.Sc., Professor
(*Medical Microbiology, Family Practice*)
Loring F. Chapman, Ph.D., Professor (*Neurology,
Psychiatry*)
Michael W. Chapman, M.D., Associate Professor
(*Orthopaedic Surgery*)
Satya N. Chatterjee, M.D., Associate Professor
(*Surgery*)
Elaine Chaykin, R.N., Lecturer (*Family Practice*)
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Professor (*Internal Medicine*)
Richard A. Chole, M.D., Ph.D., Assistant
Professor (*Otorhinolaryngology*)
Cully Cobb III, M.D., Assistant Professor
(*Neurological Surgery*)
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Matthew H. Connors, M.D., Associate Professor
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Sebastian Conti, M.D., Assistant Professor
(*Surgery*)
Guy Corkill, M.D., Professor (*Neurological
Surgery*)
Kenneth L. Cox, M.D., Assistant Professor
(*Pediatrics*)
Christel S. Cranston, M.D., Assistant Professor in
Residence (*Pediatrics*)
Carroll E. Cross, M.D., Professor (*Internal
Medicine, Human Physiology*)
James Crutcher, M.D., Assistant Professor
(*Family Practice*)
J. J. Cumiskey, M.B.B.C.R., Assistant Professor
in Residence (*Internal Medicine*)
Fitz-Roy E. Curry, Ph.D., Assistant Professor
(*Human Physiology*)
Amritlal Dajee, M.D., Assistant Professor in
Residence (*Surgery*)
Christine V. Davidson, Ph.D., Assistant Professor
in Residence (*Psychiatry*)

NOTE: For key to footnote symbols, see page 130.

Medicine

- Robert C. Davidson, M.D., Assistant Professor (*Family Practice*)
- Hamilton S. Davis, M.D., Professor (*Anesthesiology*)
- Anthony N. DeMaria, M.D., Associate Professor (*Internal Medicine*)
- Robert Demling, M.D., Associate Professor (*Surgery*)
- Gerald L. DeNardo, M.D., Professor (*Radiology, Internal Medicine, Pathology*)
- Sally J. DeNardo, M.D., Associate Professor (*Radiology*)
- Thomas A. Depner, M.D., Assistant Professor (*Internal Medicine*)
- John V. Dervin, M.D., Lecturer (*Pediatrics*)
- Pieter A. DeVries, M.D., Associate Professor (*Surgery, Pediatrics*)
- R.L. Dobson, Ph.D., Adjunct Professor (*Radiology*)
- Paul J. Donald, M.D., Associate Professor (*Otorhinolaryngology*)
- Pierre M. Dreyfus, M.D., Professor (*Neurology*)
- Arthur B. Dublin, M.D., Assistant Professor (*Radiology*)
- Robert Efron, M.D., Professor in Residence (*Neurology*)
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- William G. Ellis, M.D., Associate Professor (*Pathology, Neurology*)
- Allen C. Enders, Ph.D., Professor (*Human Anatomy*)
- Richard K. Entrikin, Ph.D., Assistant Adjunct Professor (*Physical Medicine and Rehabilitation, Pharmacology*)
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- Kent L. Erickson, Ph.D., Assistant Professor (*Human Anatomy*)
- James R. Etchison, Ph.D., Assistant Adjunct Professor (*Internal Medicine*)
- Paul A. Farrar, M.D., Associate Professor in Residence (*Radiology*)
- David Feigal, M.D., Assistant Professor in Residence (*Internal Medicine*)
- Martin Fialkov, M.D., Assistant Professor in Residence (*Psychiatry*)
- Charles J. Fisher, Jr., M.D., Assistant Professor (*Internal Medicine*)
- James H. Fisher, M.D., Assistant Professor (*Internal Medicine*)
- Neil M. Flynn, M.D., Assistant Professor (*Internal Medicine*)
- James Foerster, M.D., Assistant Professor in Residence (*Internal Medicine*)
- Carlyle H. Folkins, Ph.D., Assistant Professor in Residence (*Psychiatry*)
- William M. Fowler, Jr., M.D., Professor (*Physical Medicine and Rehabilitation*)
- Charles E. Franti, Ph.D., Professor (*Community Health, Statistics*)
- Ralph C. Frates, Jr., M.D., Assistant Professor (*Pediatrics*)
- Barry N. French, M.D., Assistant Professor (*Neurological Surgery*)
- Samuel W. French, M.D., Professor in Residence (*Pathology*)
- Charles F. Frey, M.D., Professor in Residence (*Surgery*)
- Robert P. Friedland, M.D., Assistant Professor (*Neurology*)
- Andrew J. Gabor, M.D., Ph.D., Associate Professor (*Neurology*)
- Michael C. Geokas, M.D., Professor in Residence (*Internal Medicine*)
- M. Eric Gershwin, M.D., Associate Professor (*Internal Medicine*)
- Jerry R. Gillespie, Ph.D., Professor (*Human Physiology, Physiological Sciences*)
- Robert E. Gillis, Jr., D.M.D., Lecturer (*Otorhinolaryngology*)
- Albert Globus, M.D., Associate Professor (*Psychiatry*)
- Bess Gochis, M.A., Lecturer (*Family Practice*)
- Boyd W. Goetzman, M.D., Ph.D., Associate Professor (*Pediatrics*)
- Eli Gold, M.D., Professor (*Pediatrics*)
- Ernest M. Gold, M.D., Professor (*Internal Medicine*)
- Marvin Goldman, Ph.D., Professor (*Radiology*)
- Geoffrey A. Goldsmith, M.D., Assistant Professor (*Family Practice*)
- Elliot Goldstein, M.D., Professor (*Internal Medicine*)
- Byron J. Good, Ph.D., Assistant Professor in Residence (*Psychiatry, Family Practice*)
- Mary Jo D. Good, M.A., Assistant Professor in Residence (*Psychiatry, Family Practice*)
- Arnold B. Gorin, M.D., Assistant Professor (*Internal Medicine*)
- Linda J. Gorin, M.D., Lecturer (*Pediatrics*)
- Joe W. Gray, Ph.D., Assistant Adjunct Professor (*Radiology*)
- Sarah D. Gray, Ph.D., Associate Professor (*Human Physiology*)
- Eugen O. Grecu, M.D., Assistant Professor in Residence (*Internal Medicine*)
- Jerry F. Green, Ph.D., Associate Professor (*Human Physiology*)
- Bernard R. Greenberg, M.D., Associate Professor (*Internal Medicine*)
- Les R. Greene, Ph.D., Assistant Professor in Residence (*Psychiatry*)
- Todd M. Grehl, M.D., Assistant Professor in Residence (*Surgery*)
- Douglass Gross, Ph.D., Assistant Professor (*Human Anatomy*)
- Paul F. Gulyassy, M.D., Professor (*Internal Medicine*)
- Hanns C. Haesslein, M.D., Lecturer (*Obstetrics and Gynecology*)
- Charles H. Halsted, M.D., Professor (*Internal Medicine*)
- Crystalenia C. Halsted, M.D., Assistant Professor (*Pediatrics*)
- Anthony J. Hance, Ph.D., Associate Professor (*Pharmacology*)
- Frederick W. Hanson, M.D., Associate Professor (*Obstetrics and Gynecology*)
- Fred J. Harris, M.D., Assistant Professor in Residence (*Internal Medicine, Community Health*)
- Paul G. Hattersley, M.D., Professor in Residence (*Internal Medicine, Pathology*)
- Gary L. Henderson, Ph.D., Associate Professor (*Pharmacology*)
- Andrew G. Hendrickx, Ph.D., Professor (*Human Anatomy*)
- Henry R. Herrera, M.D., Assistant Professor (*Psychiatry*)
- John W. B. Hershey, Ph.D., Professor (*Biological Chemistry*)
- H. H. Hines, Ph.D., Assistant Professor in Residence (*Radiology*)
- Patricia A. Hines, M.D., Assistant Professor in Residence (*Psychiatry*)
- Robert E. Hodges, M.D., Professor (*Internal Medicine*)
- Paul D. Hoepflich, M.D., Professor (*Internal Medicine, Pathology*)
- James W. Holcroft, M.D., Associate Professor (*Surgery*)
- Mannfred A. Hollinger, Ph.D., Associate Professor (*Pharmacology*)
- Thomas Hudson, M.D., Lecturer (*Family Practice*)
- Robert L. Hunter, Ph.D., Professor (*Human Anatomy*)
- Arthur Huntley, M.D., Assistant Professor (*Dermatology*)
- Edward J. Hurley, M.D., Professor (*Surgery*)
- Andrew Jackson, Ph.D., Assistant Adjunct Professor (*Human Physiology*)
- Lucien R. Jacobs, M.B.B.S., Assistant Professor (*Internal Medicine*)
- Gordon D. Jensen, M.D., Professor (*Psychiatry, Pediatrics*)
- Hanne M. Jensen, M.D., Associate Professor in Residence (*Pathology*)
- Chris A. Johnson, Ph.D., Assistant Professor (*Ophthalmology*)
- George W. Jordan, M.D., Associate Professor (*Internal Medicine; Pathology*)
- Michael Jordan, M.D., Associate Professor in Residence (*Internal Medicine*)
- Pat L. Joslin, M.H.S., Lecturer (*Family Practice*)
- James A. Joye, M.D., Assistant Professor (*Internal Medicine*)
- Roy A. Kaplan, M.D., Assistant Professor (*Internal Medicine*)
- Richard J. Katnik, M.D., Assistant Professor (*Neurology, Pediatrics*)
- David F. Katz, Ph.D., Associate Professor in Residence (*Obstetrics and Gynecology*)
- John L. Keltner, M.D., Associate Professor (*Ophthalmology, Neurology, Neurological Surgery*)
- Maria C. Kenney, Ph.D., Assistant Professor (*Human Anatomy*)
- David Kiener, M.D., Instructor in Residence (*Otorhinolaryngology*)
- Wendell W. Kilgore, Ph.D., Professor (*Community Health, Pharmacology*)
- Eva K. Killam, Ph.D., Professor (*Pharmacology*)
- Keith F. Killam, Jr., Ph.D., Professor (*Pharmacology*)
- Barry F. King, Ph.D., Associate Professor (*Human Anatomy*)
- Chaparola Kishore, M.D., Assistant Professor in Residence (*Anesthesiology*)
- Michael A. Klass, M.D., Lecturer (*Dermatology*)
- Robert Knight, M.D., Assistant Professor in Residence (*Neurology*)
- Jess F. Kraus, Ph.D., Associate Professor (*Community Health*)
- Kenneth A. Krohn, Ph.D., Associate Professor (*Radiology*)
- Peter E. Krumpke, M.D., Assistant Professor in Residence (*Internal Medicine*)
- Lindy F. Kumagai, M.D., Professor (*Internal Medicine*)
- Bo M. T. Lantz, M.D., Professor (*Radiology*)
- C. Largman, Ph.D., Assistant Adjunct Professor (*Internal Medicine*)
- Edward C. Larkin, M.D., Associate Professor in Residence (*Internal Medicine*)
- Lawrence J. Laslett, M.D., Assistant Professor in Residence (*Internal Medicine*)
- Jerold A. Last, Ph.D., Associate Professor in Residence (*Internal Medicine, Biological Chemistry*)
- Jack Lazerson, M.D., Professor (*Pediatrics*)
- Garrett Lee, M.D., Assistant Professor (*Internal Medicine*)
- James C. Leek, M.D., Assistant Professor (*Internal Medicine*)
- Rebecca Leonard, Ph.D., Assistant Adjunct Professor (*Otorhinolaryngology*)
- Alvin E. Lewis, M.D., Professor (*Pathology*)
- D. Robert Lewis, M.D., Instructor in Residence (*Internal Medicine*)
- Edward Lewis, M.D., Assistant Professor (*Urology*)
- Jerry P. Lewis, M.D., Professor (*Internal Medicine, Pathology*)
- James S. Lieberman, M.D., Associate Professor (*Neurology, Physical Medicine and Rehabilitation*)
- Glen A. Lillington, M.D., Professor (*Internal Medicine, Postgraduate Medicine*)
- Daniel P. Link, M.D., Assistant Professor (*Radiology*)
- Paul R. Lipscomb, M.D., Professor (*Orthopaedic Surgery*)
- George H. Lowrey, M.D., Professor Emeritus (*Pediatrics*)
- Peter Wan Woon Lui, M.D., Assistant Professor in Residence (*Anesthesiology*)
- George D. Lundberg II, M.D., Professor (*Pathology*)

- Malcolm R. MacKenzie, M.D., Professor (*Internal Medicine*)
- Dean T. Mason, M.D., Professor (*Internal Medicine, Human Physiology*)
- James W. Mathewson, M.D., Assistant Professor in Residence (*Pediatrics*)
- Nathaniel M. Matolo, M.D., Associate Professor (*Surgery*)
- Robert S. Matson, Ph.D., Assistant Adjunct Professor (*Biological Chemistry*)
- Harry Matthews, Ph.D., Associate Professor (*Biological Chemistry*)
- Donald May, M.D., Assistant Professor in Residence (*Ophthalmology*)
- Glynn E. McArn, Ph.D., Assistant Professor (*Pathology*)
- Janet McCann, B.S., Lecturer (*Family Practice*)
- William McFarland, M.D., Professor in Residence (*Internal Medicine*)
- Paul McGahan, M.D., Instructor in Residence (*Radiology*)
- Arnold Meadow, Ph.D., Professor (*Psychiatry*)
- Stanley Meizel, Ph.D., Professor (*Human Anatomy*)
- Mortimer L. Mendelsohn, M.D., Ph.D., Adjunct Professor (*Radiology*)
- Janet Mentink, F.N.P., Lecturer (*Family Practice*)
- Daniel C. Merrill, M.D., Professor in Residence (*Urology*)
- Claramae H. Miller, Ph.D., Assistant Professor in Residence (*Pathology*)
- Jay M. Milstein, M.D., Assistant Professor in Residence (*Pediatrics*)
- Paul A. Molé, Ph.D., Associate Professor (*Physical Medicine and Rehabilitation*)
- Joe P. Morgan, D.V.M., Professor (*Radiology*)
- Walter A. Morgan, M.D., Lecturer (*Family Practice*)
- Thomas L. Morrison, Ph.D., Associate Professor in Residence (*Psychiatry*)
- Nirmala N. Nayak, M.D., Assistant Professor (*Physical Medicine and Rehabilitation*)
- Kenneth R. Niswander, M.D., Professor (*Obstetrics and Gynecology*)
- Lois F. O'Grady, M.D., Professor (*Internal Medicine*)
- Mary O'Hara-Devereaux, F.N.P., Lecturer (*Family Practice*)
- Richard H. Oi, M.D., Assistant Professor (*Obstetrics and Gynecology, Pathology*)
- Harry Openshaw, M.D., Assistant Professor (*Neurology*)
- Ronan O'Rahilly, M.D., Professor (*Human Anatomy*)
- James W. Overstreet, M.D., Ph.D., Associate Professor (*Human Anatomy, Obstetrics and Gynecology*)
- Shirley Paine, M.H.S., Lecturer (*Family Practice*)
- John M. Palmer, M.D., Professor (*Urology*)
- Phillip E. S. Palmer, F.R.C.R., Professor (*Radiology*)
- Demosthenes Pappagianis, M.D., Ph.D., Professor (*Medical Microbiology*)
- Gibbe H. Parsons, M.D., Assistant Professor (*Internal Medicine*)
- Robert A. Penman, Jr., M.D., Assistant Professor in Residence (*Radiology*)
- Francis Pepitone-Rockwell, Ph.D., Assistant Professor in Residence (*Psychiatry*)
- Harold Phillips, M.D., Assistant Professor in Residence (*Radiology*)
- Neville R. Pimstone, M.D., Associate Professor (*Internal Medicine*)
- Karen Y. Poirer-Brode, M.D., Lecturer (*Obstetrics and Gynecology*)
- V. James Polidora, Ph.D., Associate Professor (*Psychiatry*)
- Norman Poppen, M.D., Assistant Professor (*Orthopaedic Surgery*)
- Bruce Porter, M.D., Instructor in Residence (*Radiology*)
- George T. Rab, M.D., Assistant Professor, (*Orthopaedic Surgery*)
- Lawrence Rabinowitz, Ph.D., Professor (*Human Physiology*)
- David D. Ralph, M.D., Assistant Professor (*Internal Medicine*)
- Antolin Raventos, M.D., Professor (*Radiology*)
- Stanley B. Reich, M.D., Professor in Residence (*Radiology*)
- Michael H. Reid, Ph.D., Associate Professor (*Radiology*)
- Michael Reinhart, M.D., Assistant Professor (*Pediatrics*)
- John A. Reitan, M.D., Associate Professor (*Anesthesiology*)
- Helmut Reinger, Ph.D., Assistant Professor in Residence (*Psychiatry*)
- Michael P. Remler, M.D., Associate Professor in Residence (*Neurology*)
- Eugene M. Renkin, Ph.D., Professor (*Human Physiology*)
- Stewart R. Reuter, M.D., Professor in Residence (*Radiology*)
- Thomas A. Riemenschneider, M.D., Professor (*Pediatrics, Internal Medicine*)
- Richard S. Riggins, M.D., Professor (*Orthopaedic Surgery*)
- Dick L. Robbins, M.D., Assistant Professor (*Internal Medicine*)
- John A. Robbins, M.D., Assistant Professor (*Internal Medicine*)
- Don A. Rockwell, M.D., Professor (*Psychiatry*)
- Peter Rogge, M.D., Instructor (*Obstetrics and Gynecology*)
- Steven D. Rose, M.D., Assistant Professor in Residence (*Internal Medicine*)
- Richard M. Rosenblatt, M.D., Assistant Professor (*Anesthesiology*)
- Carl J. Rosenquist, M.D., Associate Professor (*Radiology*)
- Alan M. Roth, M.D., Associate Professor (*Ophthalmology, Pathology*)
- Robert B. Rucker, Ph.D., Associate Professor (*Biological Chemistry*)
- Boris Ruebner, M.D., Professor (*Pathology*)
- George W. Ryst, M.D., Assistant Professor in Residence (*Otorhinolaryngology*)
- Ethelda N. Sassenrath, Ph.D., Associate Professor in Residence (*Behavioral Biology*)
- Andrew W. Saxe, M.D., Assistant Professor (*Surgery*)
- Charles Schaffer, M.D., Assistant Professor (*Psychiatry*)
- Robert J. Scibienski, Ph.D., Associate Professor (*Medical Microbiology*)
- Robert P. Scobey, Ph.D., Associate Professor (*Behavioral Biology, Human Physiology, Neurology*)
- Cynthia Scott, M.P.H., Lecturer (*Family Practice*)
- Bagher M. Sheikholislam, M.D., Associate Professor (*Pediatrics*)
- Lorraine B. Smith, M.D., Assistant Professor (*Radiology*)
- Robert El. Smith, Ph.D., Associate Professor (*Human Physiology*)
- George G. Snively, M.D., Professor (*Family Practice, Postgraduate Medicine*)
- Elaine Snyder, Ph.D., Assistant Adjunct Professor (*Neurology*)
- Harbhajan S. Sodhi, M.B.B.S., Ph.D., Professor in Residence (*Internal Medicine*)
- Robert J. Spensley, M.D., Associate Professor in Residence (*Psychiatry*)
- Robert C. Stadlnik, M.D., Associate Professor in Residence (*Radiology*)
- Larry G. Stark, Ph.D., Associate Professor (*Pharmacology*)
- Bernard E. Statland, M.D., Ph.D., Associate Professor (*Pathology*)
- Krzysztof Stengert, M.D., Professor (*Anesthesiology*)
- Margaret S. Steward, Ph.D., Associate Professor (*Psychiatry*)
- George H. Stewart, M.D., Lecturer (*Psychiatry*)
- Richard Stillman, M.D., Associate Professor in Residence (*Psychiatry*)
- Robert E. Stowell, M.D., Ph.D., Professor (*Pathology*)
- Nancy D. Sullivan, F.N.P., Lecturer (*Family Practice*)
- Marilyn A. Swanson, M.D., Assistant Professor in Residence (*Radiology*)
- Elizabeth A. Taisch, F.N.P., Lecturer (*Family Practice*)
- Peter D. Tamulevich, M.D., Assistant Professor in Residence (*Psychiatry*)
- T. Tamura, M.D., Assistant Adjunct Professor (*Internal Medicine*)
- Robert G. Taylor, M.D., Professor (*Physical Medicine and Rehabilitation*)
- Jarell Teague, M.D., Assistant Professor (*Radiology*)
- Jerold H. Theis, D.V.M., Ph.D., Associate Professor (*Medical Microbiology*)
- Wilfred E. Toreson, M.D., Ph.D., Professor (*Pathology*)
- Robert R. Traut, Ph.D., Professor (*Biological Chemistry*)
- Robert L. Treasure, M.D., Assistant Professor in Residence (*Surgery*)
- C. Treguboff, R.N., Lecturer (*Family Practice*)
- William Treguboff, M.A., Lecturer (*Family Practice*)
- John D. Trelford, M.D., Professor (*Obstetrics and Gynecology*)
- Joann M. Trolinger, F.N.P., Lecturer (*Family Practice*)
- Frederic A. Troy II, Ph.D., Professor (*Biological Chemistry*)
- Makepeace U. Tsao, Ph.D., Professor (*Surgery*)
- Joe P. Tupin, M.D., Professor (*Psychiatry*)
- C. John Tupper, M.D., Professor (*Internal Medicine, Community Health*)
- Judith Turgeon, Ph.D., Associate Professor (*Human Physiology*)
- Patrick L. Twomey, M.D., Assistant Professor in Residence (*Surgery*)
- Zakauddin Vera, M.D., Associate Professor (*Internal Medicine*)
- Nazhiyath Vijayan, M.D., Assistant Professor in Residence (*Neurology*)
- Vijaya K. Vijayan, M.D., Ph.D., Associate Professor (*Human Anatomy, Neurology*)
- Donald A. Walsh, Ph.D., Professor (*Biological Chemistry*)
- Robert M. Walter, Jr., M.D., Assistant Professor (*Internal Medicine*)
- Richard F. Walters, Ph.D., Professor (*Community Health*)
- Worden Waring, Ph.D., Professor (*Physical Medicine and Rehabilitation, Human Physiology*)
- Edward J. Watson-Williams, M.D., Professor (*Internal Medicine*)
- Phillip G. Weiler, M.D., Adjunct Professor (*Community Health*)
- Albert Weinschelbaum, M.D., Assistant Professor in Residence (*Radiology*)
- Sefton R. Wellings, M.D., Ph.D., Professor (*Pathology*)
- Richard P. Wennberg, M.D., Associate Professor (*Pediatrics*)
- Theodore C. West, Ph.D., Professor (*Pharmacology*)
- Lynda L. White, M.H.S., Lecturer (*Family Practice*)
- Barry W. Wilson, Ph.D., Professor (*Physical Medicine and Rehabilitation*)
- Lowell D. Wilson, M.D., Ph.D., Professor (*Internal Medicine, Biological Chemistry*)
- Wallace D. Winters, M.D., Ph.D., Professor (*Internal Medicine, Pharmacology, Psychiatry*)
- Bruce M. Wolfe, M.D., Assistant Professor (*Surgery*)
- Earl F. Wolfman, Jr., M.D., Professor (*Surgery*)
- Hin-Nang Wong, M.B.B.S., Assistant Professor in Residence (*Surgery*)
- Louise M. Wong, M.D., Assistant Professor (*Internal Medicine*)

Medicine

David E. Woodruff, Jr., M.D., Assistant Professor in Residence (*Internal Medicine*)
Richard Wright, M.D., Assistant Professor in Residence (*Anesthesiology*)
Julian R. Youmans, M.D., Ph.D., Professor (*Neurological Surgery*)
William Yund, Ph.D., Assistant Adjunct Professor (*Neurology*)
Jean A. Zellé, M.A., Lecturer Emeritus (*Physical Medicine and Rehabilitation*)

Admission Requirements and Professional Curriculum. Detailed information can be obtained from the School of Medicine. See also page 119.

Courses in the School of Medicine

Departmental Courses

New Grading Schedule (affecting new medical students only). Beginning with Fall Quarter 1979, medical students enrolling in the School of Medicine for the first time will be graded on the letter-grade basis. Continuing medical students will continue to receive the H/S/U mode of grading as indicated on courses listed following. For further details on the new grading system, contact the School of Medicine.

Anesthesiology

Professional Courses

420. Case Management Conference (1) I, II, III, IV. The Staff (Rosenblatt in charge)
Discussion—1 hour. Prerequisite: interns and residents; advanced medical and veterinary students; consent of instructor. Informal discussion of current hospital case material presented by house officers, students and faculty. Clinical and research experience, combined with pertinent literature references, is brought to bear on the problems with emphasis on preventative as well as corrective measures.

421. Basic Science Conference (1) I, II, III, IV. The Staff (Reitan in charge)
Discussion—1½ hours. Prerequisite: advanced medical, veterinary, and graduate students; consent of instructor. Discussion of basic science material related directly to anesthesiology, particularly in the areas of physiology and pharmacology. Selected reading assignments are given in advance and utilized by the instructor to encourage discussion. In selected instances, the topics are organized and presented by the students and residents.

490. Resident Seminar (1) I, II, III, IV. The Staff (Rosenblatt in charge)
Lecture—1 hour. Prerequisite: degree in medicine or veterinary medicine or consent of instructor. A series of lectures covering a spectrum of anesthesia and related topics in depth, primarily clinically oriented but also including relevant research material. Presented by faculty, residents, and visiting professors. Pertinent reference lists are circulated in advance of seminars.

499. Anesthesiology Research (1-6) I, II, III, IV. The Staff (Eisele in charge)
Laboratory—3-18 hours. Prerequisite: third- or fourth-year medical students or consent of instructor; open to graduate and veterinary medicine students. Problems in clinical and/or laboratory research.

Behavioral Biology

Lower Division Courses

98. Directed Group Study (1-5) I, II, III, IV. The Staff (Chapman in charge)
Discussion—1-5 hours. Prerequisite: consent of instructor. Extended evaluative and critical discussions of selected topics relating to the physiological and biochemical bases of behavior. Primary emphasis within any topic will be on the methodology, theory and concepts of current research. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III, IV. The Staff (Chapman in charge)
Prerequisite: consent of instructor. Laboratory research on selected topics relating to the biological bases of behavior. Participation in ongoing research projects or planning, initiation and execution of individual research problem. (P/NP grading only.)

Upper Division Courses

188. Recent Developments in Behavioral Biology (2) I, Polidora
Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor. What is new and interesting at the leading edge of development of behavioral biology? Through presentations by invited speakers and the instructor, the course will answer this question in lectures, demonstrations, experiential workshops and discussions. A passing grade will be contingent upon submission of a written description of each student's significant learning experience in the course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Chapman in charge)
Prerequisite: consent of instructor. Extended evaluative and critical discussions of selected topics relating to the physiological and biochemical bases of behavior. Primary emphasis within any topic will be on the methodology, theory and concepts of current research. (P/NP grading only.)

199. Special Study or Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chapman in charge)
Prerequisite: consent of instructor. Laboratory research on selected topics relating to biological bases of behavior. Participation in ongoing research projects or planning, initiation and execution of individual research problems. (P/NP grading only.)

Graduate Courses

290. Seminar (2) I, II, III, IV. The Staff (Chapman in charge)
Seminar—2 hours. Prerequisite: consent of instructor; open to graduate students. Group discussion and critique of current topics of importance and relevance to behavioral biology. (Same course as 490.)

298. Group Study (1-5) I, II, III, IV. The Staff (Chapman in charge)
Discussion—1-5 hours. Prerequisite: consent of instructor; open to graduate students. Extended evaluative and critical discussions of selected topics relating to the physiological and biochemical bases of behavior. Primary emphasis within any topic will be on the methodology, theory and concepts of current research.

299. Research (1-12) I, II, III, IV. The Staff (Chapman in charge)
Prerequisite: consent of instructor; open to graduate students. Laboratory research on selected topics relating to the physiological and biochemical bases of behavior. Participation in ongoing research projects or planning, initiation and execution of individual research problems. (S/U grading only.)

Professional Courses

451. Biology of the Mind/Body (3) I, II, III. Polidora
Lecture—2 hours; experiential laboratory—2 hours. Cognitive and experiential study of the ancient and modern monistic disciplines of the mind/body. Critical examination of several such disciplines, focusing on their common medically relevant aspects. Reading about, discussing, and experiencing mind/body interrelationships.

468. Three-Dimensional Structure of the Human Brain (1) III. Polidora
Lecture-laboratory-discussion consisting of two to three 2-hour sessions—20 hours minimum (intensive, somewhat flexible early-quarter scheduling). Course goal is the student retaining a clear, vivid, three-dimensional mental image of the major anatomical structures of the human brain. Phases: slide-illustrated lecture emphasizing function; gross dissection; build clay model of brain; identify structures on slides. (S/U grading only for graduate students.)

Biological Chemistry

Upper Division Course

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Walsh in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

213. Principles of Comparative Biochemistry (3) I, Benisek, Feeney
Lecture—3 hours. Prerequisite: Biochemistry 201C or consent of instructor. An advanced treatment of comparative biochemistry. Comparisons of living systems, their structures and functions on a molecular basis, biochemical unity and diversity; protein structures and organized enzyme systems. Comparison of biochemical processes related to photobiology, metabolism, and excretion. Offered in odd-numbered years. (Same course as Biochemistry 213.)

214. Contemporary Medical Biochemistry (1) II. The Staff (Troy in charge)
Lecture—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, which are intended to be of interest to medical students, graduate students, postdoctoral fellows and faculty. (S/U grading only.) (Same course as 414.)

***220. Molecular Biology Laboratory** (4) II. Traut, Hershey, Dio (Biochemistry)
Lecture—1 hour; laboratory—9 hours. Prerequisite: medical and graduate students with consent of instructors. A variety of laboratory techniques will be used to repeat significant experiments in the formation of our present concept of information transfer from gene to protein. Preparation of a protein synthesizing system; analysis of enzymic, nucleic acid and ribosomal components. (S/U grading only for graduate students.)

222. Mechanisms of Translational Control (2) III. Hershey
Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor. Molecular mechanisms of protein synthesis and translational controls. Examples from bacterial, mammalian and plant cells and their viruses. (S/U grading only for graduate students.)

235. Biochemical Mechanisms of Mammalian Hormones (3) II. Walsh, Wilson
Lecture—3 hours. Prerequisite: biochemistry 201A-201B-201C or consent of instructor or Medical Sciences 410. Biochemical mechanisms by which hormones modify molecular and cellular processes. Cyclic nucleotides and Ca²⁺ as hormonal second messengers. Site of action of insulin in regulation of transport, metabolism and protein synthesis. Control of gene function by steroids. Interaction between hormones. Offered in even-numbered years.

290. Current Topics in Biological Chemistry (1) I, II, III. The Staff (Walsh in charge)
Seminar—1 hour. Prerequisite: a course in biochemistry. Biochemical topics of current research interest will be discussed. Students will participate in presentation of papers and/or reviews of laboratory work in progress. (Same as course 490.)

291. Current Topics in Protein Synthesis (1) I, II, III, IV. Traut, Hershey
Discussion and seminar sessions. Prerequisite: consent of instructor. Review of current research in structure and function of bacterial and mammalian ribosomes and control of protein synthesis. (S/U grading only for graduate students.) (Same course as 491.)

298. Group Study (1-5) I, II, III, IV. The Staff (Walsh 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 (Walsh in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Clinical Psychology

Graduate Courses

200. Theory of the Person-Adult (4) I, II. Abramowitz and staff
Lecture—2 hours; seminar—2 hours. Prerequisite: graduate status in Clinical Psychology or consent of instructor. Major contemporary personality theories will be examined and compared. Emphasis will be placed on those theories which are most relevant to contemporary intervention techniques.

201. Observational Practicum (3) I, II, III, IV. The Staff (Meadow in charge)
Discussion—2 hours; laboratory—2 hours. Prerequisite: graduate status in Clinical Psychology or consent of instructor. Students rotate through three major field placements: a child-family, an adult clinical, and a community setting. The purpose is to develop skills in observing human behavior. Didactic material and field experience.

202. Theories in Clinical Child Psychology (4) I, II. Steward
Lecture—4 hours. Major theories in clinical child psychology, as related to research and clinical findings in pediatrics, child psychiatry and child development.

204. Schizophrenia Psychopathology and Intervention (3) II, III. The Staff (Meadow in charge)
Seminar—3 hours. Prerequisite: consent of instructor. Major theories on the etiology of schizophrenia and the chief methods of therapy.

205. Issues in Clinical Adult Psychology (3) I, II, III, IV. The Staff (Morrison in charge)
Lecture—3 hours. Prerequisite: consent of instructor. De-

tailed examination of theoretical and research data on topics of special interest to the faculty members, such as psychological stress, aggression, suicide, and the etiology of schizophrenia.

206. Introduction to Community Psychology (4) I, II, III. The Staff (Hersch in charge)

Lecture—2 hours; discussion—2 hours. Prerequisite: graduate status in Clinical Psychology or consent of instructor. Exploration of basic literature and relevant research findings regarding community mental health. Focus will be on basic theoretical issues, methods and results of need assessment and program evaluation, implications for mental health planning with specific emphasis on innovative programs.

208. Practicum in Group Consultation (1-3) I, II, III, IV. The Staff (Morrison in charge)

Seminar—3 hours; term paper. Prerequisite: consent of instructor. A practicum involving systematic observations, participation, and consultation in a variety of social systems including self-study groups, psychotherapy groups and educational and mental health organizations. May be repeated for credit. (S/U grading only).

209. Developmental Theory of Jean Piaget (4) III. Steward Seminar—4 hours. Prerequisite: graduate and professional students; consent of instructor. The seminar on the structured interactionist theory of Jean Piaget will include mastery of his theory of cognitive developmental stages, experience with methods of assessment and application of the core concepts to clinical psychopathology in children and adolescents. (S/U grading only.)

210. Design and Analysis in Clinical Research I (4) I. The Staff

Lecture—4 hours. Prerequisite: graduate status in Clinical Psychology or consent of instructor. Basic statistical procedures, experimental design and correlational methods used in clinical research. Emphasis will be placed on those methodologies having the broadest application to contemporary clinical investigation.

211. Design and Analysis in Clinical Research II (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate status in Clinical Psychology and course 210 or consent of instructor. Specialized methods for clinical research. Quasi-experimental, analogue, archival, single-subject and other methodological alternatives available to the clinical researcher will be reviewed.

212. The Psychology of Women (3) III. Pepitone-Rockwell, Moore

Seminar—3 hours. Prerequisite: consent of instructors. Course will trace developmental path of women — from birth to death. Implications for psychotherapy and coping styles will be explored. (S/U grading only.)

213. Theories of Psychotherapy (3) II. Lyons

Discussion—3 hours. Prerequisite: graduate student in Clinical Psychology or consent of instructor. Major theories of psychotherapy will be examined and compared. Implications for therapeutic technique and personality change will be studied. May be repeated for credit. (S/U grading only.)

214. Psychotherapy Practicum (1-3) I, II, III, IV. The Staff
Discussion—1½ hours; clinical field placement—6 hours. Prerequisite: graduate student in Psychology or consent of instructor. Supervision and discussion of clinical cases within the framework of specific models of psychotherapy. May be repeated for credit. (S/U grading only.)

215. Assessment Practicum (1-3) I, II, III, IV. The Staff
Laboratory—2-9 hours. Prerequisite: graduate student in Clinical Psychology or consent of instructor. Students will select the specific tests they need training in and will get consent of the instructor offering supervision. Students will also write assessment reports including their interpretation of test results and have them discussed with supervisor. May be repeated for credit. (S/U grading only.)

216. Psychological Assessment I (3) I, II, III, IV. Bell and staff
Seminar—3 hours. Prerequisite: graduate student in Clinical Psychology or consent of instructor. To help the student acquire critical knowledge of the methods and problems of psychological assessment with emphasis upon the theory of administration and interpretation of tests of intellectual functions and other "objective" personality measures. (S/U grading only.)

217. Introduction to Projective Assessment (3) I, II, III. Bell and staff

Seminar—3 hours. Prerequisite: graduate student in Clinical Psychology or consent of instructor. To help the student acquire critical knowledge of the theories of projective techniques with emphasis upon the theory of administration and interpretation of the Rorschach and TAT for children and adults. (S/U grading only.)

220. Clinical Behavior Therapy (3) I, II, III. Hines
Discussion—3 hours. Prerequisite: graduate standing in

Clinical Psychology or consent of instructor. Provides an overview of behavior therapy from the clinician's viewpoint, stressing the working philosophy and techniques of the behavior therapist. Techniques surveyed include relaxation training, systematic desensitization, implosion, modeling, role rehearsal, cognitive restructuring, contingency management, and self-control strategies. (S/U grading only.)

221. Intuition and Research (3) I.

Lecture—3 hours. Prerequisite: graduate student in Clinical Psychology or consent of instructor. Introduces student to subjective influences in clinical research. Also considers "variable" nature of reality.

222. Professional Development and Ethics (1-4) III. D. Rockwell, F. Pepitone-Rockwell

Seminar—1-4 hours. Prerequisite: graduate students with consent of instructor. Course intended for future professional psychologists in order to examine areas of professional ethics, the social system and its impact on the professional, and the professionalization processes. (S/U grading only.)

299. Research (1-12) I, II, III, IV. The Staff (Folkins in charge)
Prerequisite: consent of instructor. Individual or group research on selected topics. (S/U grading only.)

Community Health

Upper Division Courses

101. Perspectives in Community Health (3) I, II. Borhani, Kraus, Bauer

Lecture—2 hours; discussion—1 hour. Prerequisite: undergraduate standing. Lectures and discussions to consider in a comprehensive manner the responsibilities, obligations, and role and professional activities of various disciplines of health manpower in the community, and to orient the students with perspectives of medicine in society.

121. Introduction to Medical Ecology (3) III. Kraus

Lecture—2 hours; discussion—1 hour. Prerequisite: upper division or graduate student with interest in health sciences, human ecology, or related areas. Focus on principles of medical ecology as they relate to the study of the distribution and determinants of disease, or injury in human populations. The biological, physical and social environments are examined to show the causes, natural histories and ecological correlates of human illness.

126. Introduction to Environmental Health (4) II. Kraus

Lecture—3 hours; discussion—1 hour. Prerequisite: course 101 or introductory course in biological science. Problems in environmentally dependent aspects of individual and public health. Diseases associated with pollution of air, water, soil and food; zoonoses such as malaria, plague, rabies, and hazards of certain occupational environments are considered. (Same course as Environmental Studies 126.)

127. Contemporary Problems in Environmental Health (3) II. Kraus

Lecture—2 hours; discussion—1 hour. Prerequisite: Community Health Environmental Studies 126 or consent of instructor. Contemporary problems and issues in environmentally dependent aspects of health. Diseases and injuries from environmental carcinogens, teratogens, pesticides, noise, radiation, consumer products, stress phenomena, and heavy metals are considered. (Same course as Environmental Studies 127.)

151. Information Systems (3) I. Walters

Lecture—2 hours; laboratory—1 hour. Prerequisite: knowledge of programming in at least one high-level language, FORTRAN or ALGOL (preferred); upper division and graduate students only. To increase, through examples, projects and discussions, understanding of components of information systems, including hardware, software, economics and people, and to prepare the student to apply this understanding in solution of specific problems in creation, design and implementation of information systems.

155. Biomedical Applications of Computers (2) III. Walters
Lecture—2 hours. Prerequisite: upper division standing and capable of undertaking independent project under instructor's supervision; experience in some aspect of biomedicine; knowledge of biological and/or medical systems and computer knowledge recommended. To increase student's understanding of ways in which computers can be used to solve biomedical problems.

190. Seminar in Community Health (1) I, II, III, IV. The Staff
Seminar—1 hour. Prerequisite: upper division undergraduate standing, or graduate student. Discussion of contemporary issues and topics in community health. (P/NP grading only.)

192. Externship in Community Health Practice (1-5) I, II, III, IV. The Staff

Externship—3-15 hours. Prerequisite: open to all senior and graduate students, and consent of instructor. The totality of community health practice is observed and compared to the concepts and theory seen in didactic instruction in this field-oriented course. (P/NP grading only.)

194. Practicum in Community Health Clinics (1-5) I, II, III, IV. The Staff

Clinic session—3-15 hours. Prerequisite: upper division undergraduate 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.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Borhani in charge)

Discussion-seminar type course with occasional lecture by faculty or invited lecturer. Prerequisite: senior standing and consent of instructor. Directed group study on selected topics relating to community health. (P/NP grading only.)

199. Directed Group Study (1-5) I, II, III, IV. The Staff (Borhani in charge)

Discussion-seminar type course with occasional lecture by faculty or invited lecturer. Prerequisite: advanced undergraduate standing and consent of instructor. Directed group study on selected topics relating to community health. (P/NP grading only.)

Graduate Courses

201. Medical and Environmental Epidemiology (3) I, II, III, IV. Borhani, Kraus

Lecture—2 hours; discussion—1 hour. Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Lectures and discussions with laboratory exercises on the basic concepts of medical and environmental epidemiology as related to selected infectious, noninfectious or environmental disease processes including applications to: community health, medical ecology and prevention and disease control.

202. Community and Preventive Medicine (1-9) I, II, III, IV. The Staff (Borhani, Kraus in charge)

To be arranged. Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Lectures and discussions on basic principles of preventive medicine and observation of community health programs utilizing both specific community models of primary and secondary prevention dealing with specific disease entities.

203. Medicine and the Environment (2) I. Kraus, Borhani

Lecture—1 hour; discussion—1 hour. Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Lectures and seminar type open discussions and directed readings led by resident and guest lecturers on issues of environmental health as they relate to changing patterns or accelerated onset of disease.

204. Medical and Health Care Delivery Patterns (3) II, III. Borhani, Leonard, Bauer

Lecture—2 hours; discussion—1 hour. Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Lectures and seminar type open discussions led by resident and guest lecturers on current problems and practices in medical health care practice: delivery organization and financing systems.

205. Issues in Community Health (2) I, II. Borhani, Bauer, Kraus

Lecture—1 hour; discussion—1 hour. Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Seminar type discussions and lectures on selected topics and problems in community health including population control, drug abuse, malnutrition, abortion, suicide, and public health problems of certain population groups.

206. Nutrition and Health (2) II. Kraus, Borhani

Lecture—1 hour; discussion—1 hour. Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Lectures, selected readings, and seminar discussions on nutritional aspects of community health. Emphasis is placed on the role of nutrition, on the distribution and determinants of disease in the community and the assessment of nutritional health status.

207. Political and Economic Determinants of Health Care (3) II. Borhani

Lecture—2½ hours; discussion—½ hour. Group study to obtain an understanding of the political and economic determinants of health-care systems. Each session consists of guest lecturer and discussion. Students select and read references from a reading list. (S/U grading for graduate students; P/NP grading for undergraduates.) (Same course as Family Practice 207.)

226. Psychiatric Implications of Legal Intervention (2) I, III. Bauer, Tupin, Schuller

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. (S/U grading only.) (Same course as Psychiatry 226.)

NOTE: For key to footnote symbols, see page 130

Medicine

252. Advanced Information Systems (3) II. Walters
Lecture—2 hours; laboratory—2 hours. Prerequisite: must be able to perform at graduate level; experience in initial phases of data preparation, editing, and sorting; course 151 or the equivalent. To increase, through examples, projects and discussions, understanding of components of information systems, including hardware, software, economics and people, and to prepare students to apply this understanding in solution of specific problems in creation, design and implementation of information systems. (Same course as Biomedical Engineering 252.)

262. Use of Computers in Instruction (2) III. Walters
Seminar—2 hours. Prerequisite: graduate level competence in performing independent work, presenting for seminar discussions results of these investigations. Knowledge of computer programming required. Experience with instructional computing (for user) helpful. To enable student familiar with computers to understand range of applications in education which have been attempted in past, and potential for future applications.

290. Current Topics in Community Health (1-3) I, II, III, IV. The Staff (Borhani in charge)
Seminar—1-3 hours. Prerequisite: medical, graduate or veterinary students, or consent of instructor. Seminars, group discussions, lectures, and critique of current topics in community health, epidemiology, preventive medicine, or health care delivery. (S/U grading only for graduate students.)

294. Practicum in Community Health Clinics (1-5) I, II, III, IV. Borhani
Clinic sessions—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. Group Study in Community Health (1-5) I, II, III, IV. The Staff
Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Directed readings, discussions or community investigations in issues or problems in community health. (S/U grading only for graduate students.)

299. Research in Community Health (1-12) I, II, III, IV. The Staff
Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Directed population and community based research in selected topics in community health. (S/U grading only for graduate students.)

Family Practice

Lower Division Courses

92A-92B-92C-92D-92E-92F. Internship in Family Practice (2-2-2-2-2-2) I, II, III, IV. Goldsmith Clinics—three 8-hour sessions; clinic meeting/discussion—1 hour; directed group committee work—8 hours. Prerequisite: consent of instructor; open to lower division students. Helpful if student is bilingual in Spanish. Course provides exposure to primary health care delivery within the Family Practice setting; treatment and diagnosis of episodic and acute illnesses; screening and treatment of chronic (long-term) illnesses; the physical examination; basic laboratory testing; the reception and intake of patient; uses of referral system. (P/NP grading only.)

Upper Division Courses

110. Basic Office Skills for Physician's Assistants (2) I. Chaykin, Joslin, White
Seminar—1 hour; laboratory—3 hours. Prerequisite: must be Physician's Assistant student in Department of Family Practice. Techniques of basic office skills, medical terminology, medical ethics and the PA law in California.

120A-120B. Fundamentals of Medicine for Family Nurse Practitioners (10-10) I-II. Morgan, Walraven
Lecture—5 hours; discussion—1 hour; laboratory—12 hours. Prerequisite: student in Family Nurse Practitioner Program. Instruction and practice in the fundamentals of interview technique, taking a medical history, use of problem oriented medical records, and performing a complete physical examination. (Deferred grading only, pending completion of course sequence.)

120C-120D. Fundamentals of Medicine for Family Nurse Practitioners (10-10) III-IV. Mentink, Joslin
Lecture—5 hours; discussion—1 hour; laboratory—12 hours. Prerequisite: course 120A-120B. Study of anatomy, physiology, pathophysiology and clinical skills needed for assessment and management of common medical problems seen in primary care; approach to symptom diagnosis and treatment; management of patients with simple acute episodic disease and emergency support. (Deferred grading only, pending completion of course sequence.)

121A-121B. Introduction to Community Health for Family Nurse Practitioners (2-2) II-III. Chaykin, Mentink
Seminar—2 hours. Prerequisite: students in Family Nurse Practitioner Program. Discussion of principles of community health and components of the health care system.

121C-121D. Fundamental Issues for Family Nurse Practitioners (2-2) I-IV. Judson, Dostal
Seminar—2 hours. Prerequisite: courses 121A-121B. Discussion of the socio-cultural and psychological aspects of health and disease; methods and materials in patient education.

127. Health Sciences Practicum (5) I, II, III, IV. Andrus and staff
Lecture—1 hour; laboratory—12 hours. Prerequisite: consent of instructor. Introduction to the health professions and health care delivery system through lecture and experience in clinical settings. (P/NP grading only.)

192A-192B-192C-192D-192E-192F. Internship in Family Practice (2-2-2-2-2-2) I, II, III, IV. Goldsmith
Clinics—three 8-hour sessions; clinic meeting/discussion—1 hour; directed group committee work—8 hours. Prerequisite: open to upper division students; satisfactory completion of course 92A-92B-92C-92D-92E-92F and consent of instructor. Helpful if student is bilingual in Spanish. Based on the acquisition of skills derived in course 92. The student will now be in a position to be a health care member of Clinica Tepati as well as a teaching assistant. These quarters will include being responsible for leadership in reception intake routine lab techniques (under M.D. supervision). Taking vital signs, organizing and monitoring medical records and retrieval system. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Burr in charge)
Prerequisite: consent of instructor. Directed group study for advanced undergraduates interested in health care delivery system. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Burr in charge)
Hours to be arranged. Prerequisite: consent of instructor. Special study for advanced undergraduates interested in the health care delivery system. (P/NP grading only.)

Graduate Courses

207. Political and Economic Determinants of Health Care (3) II. Goldsmith, Borhani
Lecture-discussion—3 hours. Group study to obtain an understanding of the political and economic determinants of health-care systems. Each session consists of guest lecturer and discussion. Students select and read references from a reading list. (S/U grading only for graduate students; P/NP grading only for undergraduates.) (Same course as Community Health 207.)

***266. Law and Medicine** (3) I. Schwartz and Staff
Lecture—3 hours. Prerequisite: second-year medical and second- and third-year law students with consent of instructor. Seminar approach emphasizing class work, field trips, individual projects re medical education and practice, attorney-physician relations, development of human behavior, community health care and medicolegal problems. (Same course as Law 266.)

***271. Clinical Pharmacology** (2-10) I, II, III, IV. Winters
Lecture—2-10 hours; ward rounds. Prerequisite: advanced graduate students or postdoctoral fellows. Principles of pharmacology will be related to the diagnosis and treatment of drug induced disease status as well as principles of therapy of common clinical diseases. (Same course as Pharmacology 271.)

298. Group Study (1-5) I, II, III, IV. Burr, O'Hara-Devereaux
Prerequisite: consent of instructor. Group study for graduate students to explain selected areas of primary care and the health care delivery system. (Sect. 1, letter grading only; all other sections, S/U grading only.)

Professional Courses

***406A-406B-406C. Primary Care in Sports Medicine** (2,2,2) I, II, III. Burr
Lecture—1 hour; laboratory—2 hours. Prerequisite: second-year medical students or consent of instructor; open to graduate students. First quarter will cover primary health care in sports medicine—prevention, treatment and rehabilitation. Second quarter will deal with the physical fitness programs in health and disease—health care maintenance and rehabilitation. Third quarter is for independent study in sports medicine.

410A. Analysis of Health Care Delivery Systems (3) II. Mitchell, Andrus
Lecture—3 hours. Prerequisite: student in the Family Nurse Practitioners Program. This course is designed to provide an understanding of the economics and organization of health care systems. Topics include system history, cost issues, quality of care, legislation and licensure, human resources and planning.

410B. Analysis of Health Care Delivery Systems (3) III. Mitchell, Andrus
Lecture—3 hours. Prerequisite: student in the Family Nurse Practitioners Program. This course is designed to provide an understanding of the economics and organization of health care systems. Topics include system history, cost issues, quality of care, legislation and licensure, human resources and planning.

411A. Family Structure and Function for Family Nurse Practitioners (2) II. O'Hara-Devereaux
Lecture—1 hour; discussion—1 hour. Prerequisite: student in Family Nurse Practitioner Program. Topics aimed at providing a theoretical understanding of the contemporary American family as a social unit; includes human development, family organization, roles and dynamics.

411B. Family Structure and Function for Family Nurse Practitioners (2) III. O'Hara-Devereaux
Lecture—1 hour; discussion—1 hour. Prerequisite: student in Family Nurse Practitioner Program. Topics aimed at providing a theoretical understanding of the contemporary American family as a social unit; includes human development, family organization, roles and dynamics.

420A-420B-420C. Advanced Clinical Medicine for Family Nurse Practitioners (5-5-5) I-II-III. Chaykin, Sullivan, Trolinger
Lecture—1 hour; seminar—2 hours; laboratory—6 hours. Specialty topics in Family Medicine selected by student and presented in seminar form with an annotated bibliography. An expert in each selected field will attend and critique.

421A. Graduate Seminar in Preventive Medicine for Family Nurse Practitioners (2) I. O'Hara-Devereaux, Andrus
Lecture—2 hours; discussion—1 hour. Prerequisite: consent of instructor. Selected topics related to disease prevention and health maintenance. (S/U grading only for graduate students.)

421B. Graduate Seminar in Psychosocial and Cultural Aspects of Disease for Family Nurse Practitioners (2) II, III. O'Hara-Devereaux, Andrus
Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor. Selected topics of cultural, ethnic and socioeconomic parameters related to disease prevention patterns and therapeutics; family and marital counseling; psychosomatic illness; and human sexuality. (S/U grading only for graduate students.)

421C. Graduate Seminar in Clinical Geriatrics (3) III. Scott, Sullivan
Lecture—2 hours; discussion—1 hour. Prerequisite: consent of instructor. Selected topics in geriatrics will cover clinical variations, new developments in management and the psycho-social issues involved in the care of elders.

***421D. Graduate Seminar in Clinical Medicine for Family Nurse Practitioners** (2) I. Mentink
Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor. Review and study of current patterns of management of the common chronic diseases; application of flow sheet monitoring, record audits and algorithms. (S/U grading only.)

449. Research Methods for Practitioners (3) I. Mitchell, O'Hara-Devereaux
Lecture—3 hours. Prerequisite: student in the Master of Health Services Degree Program. Basic concepts of research design and methods, processing data and preparing research reports. (S/U grading only.)

450A-450B. Primary Care Practicum for Family Nurse Practitioners (5-5) I, II, III, IV. Andrus, Chaykin
Discussion—1 hour; laboratory—8 hours. Prerequisite: courses 410, 420A-420B-420C, and 449. Course 450B is a continuation of course 450A. Individual field study. Each student will analyze a health care setting; plan, implement, and evaluate changes designed to improve health care to patients and their families.

475. Fundamentals of Psychological Medicine (3) I, II, III, IV. May
Lecture—1½ hours; discussion—1½ hours. Prerequisite: Medical and Family Nurse Practitioner students only; consent of instructor. Course focuses on the participants' intra- and interpersonal patterns of response to interpersonal interactions. A model for reducing interpersonal stress is presented and participants are required to videotape one interview using this model. Role-playing is used extensively as well as the dynamics of interactions between group members. (S/U grading only.)

Human Anatomy

Upper Division Courses

101. The Gross and Microscopic Structure of the Human Body (4) II. Hunter
Lecture—4 hours; laboratory—3 hours. Prerequisite: Bio-

logical Sciences 1 or 10; Physiology 2-2L or Zoology 2-2L 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, III. Hunter
Laboratory—two 3-hour sessions. Prerequisite: course 101 (may be taken concurrently). Laboratory will be taught from dissections, models and slides to give students the opportunity to learn structure from direct experience.

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Discussion—2 hours; laboratory—0-6 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

201. Human Neuroanatomy (6) II, V. Vijayan
Lecture—5 hours; laboratory—3 hours. Prerequisite: consent of instructor. Macroscopic anatomy of the nervous system to include its relationship to coverings, topography, and blood supply. Microscopic anatomy, pathways and internal organization of the nervous system.

202. Teratology (2) II. Hendrickx
Lecture—1 hour and laboratory—2 hours (sessions variable). Prerequisite: embryology and anatomy or consent of instructor. Principles and concepts of abnormal development; including use of animal models, role of conceptus, placenta and maternal system in teratogenic susceptibility and extrapolation of animal tests to humans. Laboratory includes experimental design, animal experimentation, and embryonic and fetal evaluation. Offered in odd-numbered years.

205. Biology of Mammalian Gametes and Fertilization (2) II. Meizel
Lecture—1½ hours; discussion—½ hour. Prerequisite: lecture courses in biochemistry, cell biology (or histology), and physiology (with some endocrinology); consent of instructor. Biochemical, morphological and physiological aspects of normal mammalian gonads; gametogenesis; ovulation; gamete maturation and transport; fertilization. Offered in even-numbered years.

***211. Prenatal Development of Human Nervous System** (5) I, II, III, IV. O'Rahilly
Discussion—4 hours; laboratory—2 hours. Prerequisite: consent of instructor and substantial background in biology, including basic embryology. Graduate course for comprehensive study of development of human nervous system, including, where possible, correlation with development of function and behavior. (S/U grading only.)

212. Advanced Course in Human Prenatal Development (5) I, II, III, IV. O'Rahilly
Discussion—4 hours; laboratory—2 hours. Prerequisite: consent of instructor and substantial background in biology, including basic embryology. Graduate course for study of human development in general, with emphasis on certain systems to be decided on. (S/U grading only.)

213. History of Anatomy (4) I, II, III, IV. O'Rahilly
Discussion—4 hours. Prerequisite: consent of instructor. Graduate course on chronological history of human and comparative anatomy. (S/U grading only.)

290. Seminar (1) I, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. (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 Course

405. Human Gross Anatomy (6) II, III. Erickson
Lecture—2 hours; laboratory—6 hours. Prerequisite: second- or fourth-year medical student, graduate student and/or consent of instructor. This course is designed to give students a comprehensive understanding of the gross structure of the adult human body. (Deferred grading only, pending completion of course.)

Human Physiology

Upper Division Courses

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Renkin 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 (Renkin in charge)
Laboratory—1-15 hours; undergraduate research project. Prerequisite: senior standing in biology, chemistry, physics, psychology, or engineering. (P/NP grading only.)

Graduate Courses

***200D. Advanced General Physiology** (3) III. The Staff (Renkin in charge)
Lecture—3 hours. Prerequisite: Biochemistry 101B, Chemistry 110B, Physiology 100B; graduate standing and consent of instructor. Physicochemical basis of living systems with emphasis on membrane permeability of characteristics at both the cellular and tissue level. Offered in even-numbered years.

213. Cellular Physiology of Excitable Membranes (4) I, Scobey
Lecture—2 hours; discussion—1 hour; 1 hour problem sets or written review per week. Prerequisite: elementary physics and calculus. Beginning with electrochemistry, this course uses elementary calculus and physics for lectures and problem sets on diffusion potentials, electrotonic conduction, synaptic transmissions, etc. Several topics will be covered by invited lecturers on their research interests. Offered in odd-numbered years.

***221. Surgical Approaches to Physiology** (2) I, II, III, IV. Green
Discussion—1 hour; laboratory—3 hours. Prerequisite: Medical Sciences 411A-411B or the equivalent and consent of instructor. Practical laboratory experience in classical surgical techniques used to obtain physiological information. (P/NP grading only.)

231. Renal Physiology (3) I. Rabinowitz
Lecture—3 hours. Prerequisite: Physiology 110A, 110B or the equivalent; graduate standing. Topics in mammalian renal physiology and related areas of biological transport, fluid and electrolyte homeostasis, comparative renal physiology, and pathophysiology of the kidney in man.

231L. Renal Physiology Laboratory (1) I, Rabinowitz
Laboratory—3 hours. Prerequisite: Physiology 110A, 110B or the equivalent; graduate standing and consent of instructor. Experimental study of renal function in mammals including measurement of renal blood flow, filtration rate, concentrating ability, excretion of ions and the action of hormones and drugs.

235. Physiology of the Body Fluids (2) III. Rabinowitz
Lecture-discussion—2 hours. Drill and problem sets on fundamental properties and behavior of body fluid compartments including water, Na, K, Cl, distribution and exchange. Lectures on development of modern concepts. Assigned reading and discussion of clinically oriented articles on the subject. Grading based on attendance and student-given brief reports.

***260. Physiological Systems Analysis** (5) I, Smith
Lecture—4 hours; discussion—1 hour. Prerequisite: Mathematics 22B or Physiology 108, and Physiology 110B; or consent of instructor. The quantitative analysis of physiological control systems; mathematical models and analytic methods appropriate for the study of different types of physiological control; the application of these techniques to investigation of homeostasis.

280. Pulmonary Function Evaluation (4) I, II, III. Cross
Lecture—3 hours; laboratory—3 hours. Prerequisite: Medical Sciences 411B or the equivalent and consent of instructor. (Same course as 480.)

283. Respiratory Physiology (3) III. The Staff (Green in charge)
Lecture—3 hours. Prerequisite: Physiology 211 or the equivalent, and consent of instructor. Topics in mammalian respiratory physiology and related areas. These include pulmonary mechanics, pulmonary circulation, gas exchange, and the control of respiration. Offered in even-numbered years.

284. Cardiovascular Physiology (3) III. Green
Lecture—3 hours. Prerequisite: Physiology 211 or the equivalent and consent of instructor. Topics in mammalian cardiovascular physiology and related topics. These include capillary dynamics, pressure-flow relationships in the peripheral circulation, cardiac mechanics, and regulation of cardiac output. Offered in odd-numbered years.

285. Peripheral Circulation (3) III. Gray
Lecture—1 hour; discussion—2 hours. Prerequisite: Phys-

iology 110B, 111B, or the equivalent and consent of instructor. Course will consist of a series of lectures and discussion sessions on the physiology of mammalian peripheral circulation including topics on: anatomy, physiology, and pharmacology of vascular smooth muscle, regional circuits, microcirculatory control mechanisms, and dynamics of capillary transport. Offered in even-numbered years.

298. Group Study (1-5) I, II, III, IV. The Staff (Renkin 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 (Renkin in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Internal Medicine—Allergy

Graduate Course

281. Clinical Immunology and Immunopathology (4) III. Gershwin
Lecture—4 hours. Prerequisite: Medical Microbiology 207 or Veterinary Microbiology 106. Descriptive analysis of animal and human pathologic processes that interact with the immune system. Emphasis on infections, genetics, transplantation, allergy and autoimmunity. Offered in even-numbered years. (Same course as Rheumatology 281.)

Internal Medicine—Cardiology

Upper Division Courses

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Amsterdam in charge)
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 (Amsterdam in charge)
Prerequisite: consent of instructor; senior standing in biology, chemistry, physics, psychology or engineering. Undergraduate research project. (P/NP grading only.)

Graduate Courses

298. Group Study (1-5) I, II, III, IV. The Staff (Mason 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 (Mason in charge)
Prerequisite: consent of instructor. Thesis research. (S/U grading only.)

Internal Medicine—Endocrinology

Graduate Course

299. Research (1-12) I, II, III, IV. The Staff (Kumagai in charge)
Prerequisite: consent of instructor. Endocrinology research. (S/U grading only.)

Internal Medicine—General Medicine

Professional Course

499. General Medicine Research (1-18) I, II, III, IV. Flynn
Discussion—3 hours; laboratory—8-40 hours. Prerequisite: consent of instructor. The student will be involved in a laboratory research problem within the areas, interest and expertise of members of the Section of General Internal Medicine. Alternately, the research effort will be directed toward investigation of a clinical problem of general medical interest.

Internal Medicine—Hematology-Oncology

Upper Division Course

199. Research in Hematology—Oncology (1-5) I, II, III, IV. MacKenzie and staff
Laboratory—hours variable. Prerequisite: upper division standing and consent of instructor. Experience in laboratory research. (P/NP grading only.)

NOTE: For key to footnote symbols, see page 130

Medicine

Graduate Courses

298. Topics in Hematology (1-5) I, II, III, IV. The Staff (Lewis in charge)

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. The Staff (Lewis in charge)
Prerequisite: consent of instructor. Laboratory investigation contributing to the dissertation for a graduate degree. (S/U grading only.)

Internal Medicine — Infectious Diseases

Upper Division Course

199. Infectious Diseases Research (1-5) I, II, III, IV. The Staff (Hoeprich in charge)

Discussion—1 hour, seminar—1 hour, laboratory—4 hours; per individual arrangement with instructor. 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. A 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 the instructor and via seminar presentation. (P/NP grading only.)

Professional Course

499. Research Topics in Infectious Disease (2-12) I, II, III, IV. The Staff (Hoeprich in charge)

Prerequisite: successful completion of the first year of study in School of Medicine, graduate students, 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.

Internal Medicine—Nutrition

Graduate Course

210. Nutritional Aspects of Medical Practice (3) III. The Staff
Lecture-discussion—3 hours. Prerequisite: medical and graduate students and/or consent of instructor. Lectures and reading assignments on clinical nutrition. Preselected topics will relate to disease processes, organ systems and patient care. (S/U grading for graduate students).

Internal Medicine—Pulmonary Medicine

Upper Division Course

199. Research (1-5) I, II, III, IV. The Staff (Gorin in charge)
Discussion—2 hours; laboratory—6 hours (minimum); paper to be prepared over term. Prerequisite: consent of instructor. Research in problems of lung water balance, vascular permeability, acute lung injury. Techniques involve large animal surgery, use of radioisotopes, physiologic monitoring, and biochemical analysis. (P/NP grading only.)

Graduate Course

299. Research in Lung Pathophysiology (1-12) I, II, III, IV. The Staff

Discussion—2 hours; laboratory—6 hours (minimum); paper to be prepared over term. Prerequisite: consent of instructor. Research in problems of chronic and acute lung injury, lung immunobiology. Techniques involve large animal surgery, radioisotope tracer technique, physiologic monitoring, biochemical and immunologic analysis. (S/U grading only.)

Professional Course

491. Research in Lung Pathophysiology (2-3) I, II, III, IV. The Staff

Discussion—2 hours; laboratory—3 hours maximum; term paper. Prerequisite: undergraduate course in biochemistry or physiology. Research in problems of lung water balance, vascular permeability, acute lung injury, lung immunobiology. Techniques involve large animal surgery, radioisotope tracer technique, physiologic monitoring, biochemical and immunologic analysis.

Internal Medicine— Rheumatology

Lower Division Course

99. 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.)

Upper Division Course

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

Lecture—4 hours. Prerequisite: Medical Microbiology 207 or Veterinary Microbiology 106. Descriptive analysis of animal and human pathologic processes that interact with the immune system. Emphasis on infections, genetics, transplantation, allergy and autoimmunity. Offered in even-numbered years. (Same course as Allergy 281.)

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 lab work as required. (S/U grading only for graduate students.)

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], aplenic, and New Zealand mice) and the cellular immune system of patients with systemic lupus erythematosus, Sjogren's syndrome, polymyositis and drug hypersensitivity. (S/U grading only for graduate students.)

Medical Microbiology

Upper Division Courses

107. Chemical and Cellular Immunology (4) II. Benjamini, Scibienski

Lecture—4 hours; laboratory experience provided to selected individual students. Prerequisite: Biochemistry 101A, 101B or consent of instructor. The chemical and cellular basis of immunity: structure-function relationship of antigens, antibodies, and antigen-antibody interaction; cellular basis of immunity; immunochemical and cellular aspects of hypersensitivity and related immunological phenomena. (Same course as course 407.)

115. Ecological Parasitology (2) II. Theis

Lecture—2 hours. Course will be devoted to the study of mankind's influence on environmental factors that affect the development and spread of parasitic agents.

130. Medical Mycology (2) III. Pappagianis

Lecture—2 hours. Prerequisite: 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. (Same course as 430.)

198. Group Study in Medical Microbiology (1-5) I, II, III, IV. The Staff (Pappagianis 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 (Pappagianis in charge)

Hours to be arranged. Prerequisite: upper division standing and consent of instructor. Individual research. (P/NP grading only.)

Graduate Courses

209. Frontiers in Immunology (2) I, II, III. Benjamini, Scibienski

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: grad-

uate students with consent of instructor. Epidemiological and laboratory studies of protozoa, helminths and arthropods of medical importance.

220. Current Concepts in Bacterial Ultrastructure (2) III. Beaman

Lecture—1 hour; discussion—1 hour: combination formal lectures, class discussion and student presentation. Prerequisite: Bacteriology 105 or consent of instructor. A critical evaluation of the current literature dealing with all aspects of bacterial ultrastructure. These will be combined formal lectures, discussion of selected and assigned reading and formal student presentation of assigned topics. There will be a midterm and final examination.

298. Group Study in Medical Microbiology and Immunology (1-5) I, II, III, IV. The Staff (Pappagianis 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, IV. The Staff (Pappagianis 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

401. Medical Virology (2) II. Chang

Lecture—1 hour; discussion—1 hour. Prerequisite: Medical Sciences 410 and consent of instructor; open to graduate students. Course deals with the clinical epidemiological, and experimental aspects of viral diseases of man.

405. Clinical Immunology (2) I. Pappagianis

Lecture—2 hours. Prerequisite: third-year medical student status and/or consent of instructor. The bases of immunization practices and immunoserologic diagnostic procedures particularly related to diseases of man.

407. Chemical and Cellular Immunology (4) II. Benjamini, Scibienski

Lecture—4 hours; laboratory experience provided to selected individual students. The chemical and cellular basis of immunity: structure-function relationship of antigens, antibodies and antigen-antibody interaction; cellular basis of immunity; immunochemical and cellular aspects of hypersensitivity and related immunological phenomena. (S/U grading only.) (Same course as course 107.)

Neurology

Graduate Course

290. Seminar in Selected Topics (1) I, II, III, IV. Scobey
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 (Dreyfus 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. Scobey

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 Course

499. Research (1-12) I, II, III, IV. The Staff (Dreyfus in charge)

Laboratory—2-24 hours. Prerequisite: consent of instructor. Laboratory investigation on selected topics. (S/U grading only for graduate students.)

Neurosurgery

Graduate Course

286. Diseases of the Nervous System (3) I, II, III, IV. The Staff (Youmans in charge)

Lecture—1 hour; discussion—1 hour; seminar—1 hour. Prerequisite: general pathology or special training in pathology and neurological sciences; consent of instructor. Reaction of the nervous system to injury and infection; degenerative and vascular diseases of the nervous system; neoplasia in the nervous system. Given jointly with Departments of Neurology and Pathology.

Professional Course

423. Brain-Cutting Conference (1) I, II, III, IV. The Staff (Youmans in charge)
Seminar—1 hour. Prerequisite: medical and veterinary students, interns and residents; consent of instructor. Current specimens are sectioned and discussed. Given jointly with Departments of Neurology and Pathology. (Same course as Pathology 405, Medicine.)

Orthopaedic Surgery**Professional Course**

401A. Sports Medicine: Medical Aspects of Sports Injuries (2) I. The Staff (Riggins in charge)
Lecture — 2 hours. Prerequisite: completion of Core A for medical students; upper division course in systemic physiology and anatomy for graduate students. A multidisciplinary course introducing the student to 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. (S/U grading only for graduate students.) (Same course as Physical Medicine and Rehabilitation 201A, 401A, Physical Education 201A.)

401B. Sports Medicine: Physiological Basis of Exercise Testing and Exercise Training (3) II. The Staff (Bernauer, Physical Education, in charge)
Lecture — 2 hours; two 4-hour laboratory projects; discussion — four 2-hour sessions. Prerequisite: completion of Core A for medical students; upper division course in systemic physiology and anatomy for graduate students. Course introduces the student to methods and assessment of exercise physiology and exercise testing. Principles of exercise training for normal individuals and patients with various diseases and weight reduction and control will be discussed. (S/U grading only for graduate students.) (Same course as Physical Medicine and Rehabilitation 201B, 401B, Physical Education 201B.)

401C. Sports Medicine: Special Problems in Prescribing and Appraising Exercise Program (3) III. The Staff (Bernauer, Physical Education, in charge)
Lecture—2 hours; two 4-hour laboratory projects; discussion—four 2-hour sessions. Prerequisite: completion of Core A for medical students; upper division course in systemic physiology and anatomy. Review of special problems related to specific sports and recreational activities. Areas to be covered include SCUBA diving, backpacking, jogging and skiing as well as specific exercise programs for disabled and aged. (S/U grading only for graduate students.) (Same course as Physical Medicine and Rehabilitation 201C, 401C, Physical Education 201C.)

499. Orthopaedic Research (1-12) I, II, III, IV. The Staff (Agee in charge)
Prerequisite: medical students; consent of instructor. Laboratory or clinical investigation on selected topics.

Otorhinolaryngology**Professional Courses**

400. Suture Techniques (1) I, II, III, IV. Bernstein
Lecture—5 hours total; laboratory—10 hours total. Prerequisite: second- and fourth-year medical students with consent of instructor; open to graduate and veterinary medical students. Principles of management of lacerations and the various techniques of suturing a wound.

401. Clinical Examinations in Otorhinolaryngology (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. Obtaining the history, applied anatomy of the regions, and the art of the examination. Head mirror required.

402. Otorhinolaryngology in Family Practice (1) I, II, III, IV. Donald
Lecture—10 hours total. Prerequisite: fourth-year medical students and family practitioners with consent of instructor; open to graduate students. Planned as a refresher course for those already possessing a background of knowledge in the specialty.

460. Clinical Otorhinolaryngology Elective (3-18) I, II, III, IV. Chole
Full-time clinical activity. Prerequisite: third- and fourth-year medical students with consent of instructor; open to graduate students. Total involvement in clinical activities of the department.

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. Monthly review of current otorhinolaryngologic and related literature and recent advances.

491. Otorhinolaryngologic Seminars (1) I, II, III, IV. The Staff (Bernstein in charge)
Seminar—1 hour. Prerequisite: fourth-year medical students with consent of instructor; open to graduate students. Weekly formal presentations of general otorhinolaryngologic topics. The subjects will be clinically oriented and explored in depth.

499. Research (1-12) I, II, III, IV. Donald
Prerequisite: medical students with consent of instructor; open to graduate students. Participation in ongoing projects.

Pathology**Undergraduate Course**

199. Special Study in Pathology for Advanced Undergraduates (1-5) I, II, III, IV. Cardiff
Prerequisite: advanced undergraduate, and consent of instructor. Independent research studies on the pathogenesis of disease under the direction of a faculty member. (P/NP grading only.)

Graduate Courses

207. Introduction to Nervous System Pathology (1-4) III. Ellis
Lecture—1 hour; discussion—1 hour; seminar—2 hours. Prerequisite: open to undergraduate, graduate, and veterinary students with consent of instructor. 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; discussions provide instruction in microscopic techniques.

210. Introduction to Human Pathology (5) I. The Staff (Stowell in charge)
Lecture—3 hours; discussion—2 hours. Prerequisite: upper division undergraduate and graduate students with an adequate background in gross anatomy, histology, physiology, and biochemistry. Study of the processes, causes and effects of disease, including inflammation, neoplasia, immunology, parasitology, degeneration, abnormalities of growth, and injuries due to environmental and toxic agents. Offered in even-numbered years.

298. Advanced Group Study (1-5) I, II, III, IV. The Staff (Wellings in charge)
Lecture—1-2 hours; discussion—1-2 hours; laboratory—2 hours. Prerequisite: consent of instructor. Group study in a variety of advanced topics in general and special pathology.

299. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Research in the mechanisms of disease, the effects and causes of injury, neoplasia, neuropathology and comparative pathology. (S/U grading only.)

Professional Courses

402. Current Topics in Tumor Biology (1) I, II, III. Cardiff, Faulkin, Wellings
Seminar—2 hours. Prerequisite: graduate and medical students. A 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.

403. Gross Autopsy Review (1) I, II, III, IV. Toreson
Discussion-seminar—1 hour. Prerequisite: medical students or consent of instructor; open to graduate students. Current autopsies are reviewed in detail with clinicopathological correlation. Limited enrollment.

404. Forensic Pathology (2) I. The Staff
Lecture—1 hour; laboratory—1 hour. Prerequisite: medical students or consent of instructor; open to graduate students. Systematic study of current forensic cases with emphasis on differential diagnosis, preservation of evidence, and medicolegal procedure. Includes introduction to histopathologic diagnosis and toxicology. Limited enrollment.

***405. Brain-cutting Conference** (1) I, II, III, IV. Ellis
Seminar—1 hour. Prerequisite: medical students or consent of instructor, open to graduate students. Current specimens are sectioned, discussed, and clinical correlations proposed. (Same course as Neurosurgery 423.)

406. Histopathologic Diagnosis (1) I, II, III. The Staff (Toreson in charge)
Seminar—1 hour. Prerequisite: medical students or consent of instructor; open to graduate students. Intensive and detailed histopathologic diagnosis. Material covered varies. Limited enrollment.

407. Diseases of the Nervous System (1-4) I, II, III. Ellis
Lecture—1 hour; discussion—1 hour; seminar—1 hour. Prerequisite: medical students or special training in pathology or neurological sciences; consent of instructor; open for credit to graduate students. 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. Autopsy Case Studies (1-12) I, II, III, IV. The Staff (Ruebner in charge)
Discussion—1-4 hours; laboratory—3-24 hours. Prerequisite: medical and veterinary students with consent of instructor; open for credit to graduate students. Participation and performance under supervision of complete autopsies with correlative studies of clinical material, gross, microscopic, and laboratory findings.

409. Neuropathology Conference (1) I, II, III, IV. Ellis
Seminar—1 hour. Prerequisite: medical students or consent of instructor; open for credit to graduate students. Neuropathologic findings in current cases are correlated with clinical findings and compared with previously reported cases. Given jointly with Departments of Neurology and Neurosurgery.

490. Seminar in Pathology (2) I, II, III. Ruebner
Seminar—2 hours. Prerequisite: consent of instructor; open for credit to graduate students. Student participation course in the mechanisms of disease. Given jointly by the Departments of Pathology in the medical and veterinary schools. Limited enrollment.

491. Surgical Pathology Seminar (1) I, II, III, IV. The Staff (Toreson in charge)
Seminar—1 hour. Prerequisite: medical students or consent of instructor; open for credit to graduate students. Gross and microscopic pathology of current surgical specimens and study sets with clinicopathological correlation. Limited enrollment.

***492. Ultrastructure Seminar** (1) I, III. Jensen
Seminar—1 hour. Prerequisite: medical veterinary, and graduate students, or consent of instructor. Electron micrograph and methodology; workshop participants are encouraged to bring their own material and problems for discussion. Limited enrollment.

Pediatrics**Lower Division Course**

99. Special Study for Undergraduates (1-5) I, II, III, IV. The Staff (Gold in charge)
Individual library or laboratory research. Prerequisite: consent of instructor; Chemistry 1B and Biological Sciences 1 or the equivalent (may be taken concurrently). Research in the broad area of physiological maturation. Primarily for lower division students. (P/NP grading only.)

Upper Division Course

199. Special Study in Pediatric Research (1-5) I, II, III, IV. The Staff (Gold in charge)
Laboratory—3-15 hours. Prerequisite: limited to undergraduates with consent of instructor, based on adequate preparation in chemistry and/or physiology. Problems related to growth and development including the functions of different organ systems. Also learn different laboratory techniques and use of different laboratory equipment. (P/NP grading only.)

Graduate Course

299. Pediatric Research (1-12) I, II, III, IV. The Staff (Gold in charge)
Prerequisite: graduate students who are candidates for a degree in some area of biology or behavioral sciences; consent of instructor. Research will generally involve some aspect of growth and development. (S/U grading only.)

Pharmacology**Lower Division Course**

99. Special Study for Undergraduates (1-3) I, II, III, IV. The Staff (Department Chairperson in charge)
Laboratory—1-3 hours. Prerequisite: lower division stand-

Medicine

ing. Laboratory experience in pharmacology and related fields. (P/NP grading only.)

Upper Division Courses

100. Pharmacology for Educators (2) I, E. K. Killam
Lecture—2 hours. Prerequisite: 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 topic.

101. Introduction to Pharmacology (2) II. Hollinger, Stark
Lecture—2 hours. Prerequisite: some knowledge of basic physiology and biochemistry. Survey course dealing with various principles of pharmacology. Course is specifically oriented to the undergraduate.

198. Directed Group Study (1-5) I, II, III, IV. The Staff (K. F. Killam in charge)
Prerequisite: consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (K. F. Killam in charge)
Laboratory—3-9 hours. Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200A-200B. Advanced General Pharmacology (3-3) I-II. The Staff (K. F. Killam in charge)
Lecture—3 hours. Prerequisite: upper division courses in biochemistry (101A-101B) and mammalian physiology (110A-110B and 111A-111B) or the equivalent. May be taken concurrently. A "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.

200AL-200BL. Advanced General Pharmacology (1-1) I-II. The Staff (K. F. Killam in charge)
Discussion—1 hour; laboratory—3 hours. Prerequisite: upper division courses in biochemistry (101A-101B) and mammalian physiology (110A-110B and 111A-111B) or the equivalent. Laboratory procedures in advanced pharmacology. Experiments and discussion designed to follow subject-matter sequence of 200A-200B.

201. Pharmacology of the Nervous System I: Transmitter Substances (1-3) I, Hance
Lecture—1 hour; discussion—1 hour. Prerequisite: courses 101, 102, and 103 or Medical Science 410, 411B and 413A-413B-413C, or the equivalent. Pharmacology of substances affecting nervous transmission. Offered in odd-numbered years.

202. Pharmacology of the Nervous System II: Hypnotics, Sedatives and Anesthetics (1-3) I, E. K. Killam
Lecture—1 hour; discussion—1 hour. Prerequisite: courses 101, 102, 103 or Medical Science 410, 411B and 413A-413B-413C, or the equivalent. Pharmacology of centrally acting sedative, hypnotic and anesthetic agents with emphasis on alterations in brain function. Offered in even-numbered years.

203. Pharmacology of the Nervous System III: Stimulants and Anticonvulsants (1-3) II, Stark
Lecture—1 hour; discussion—1 hour. Prerequisite: courses 101, 102, and 103 or Medical Science 410 and 411B, or the equivalent. Pharmacology of stimulant and convulsant agents, anticonvulsant agents and their evaluation in animal models. Offered in even-numbered years.

204. Pharmacology of the Nervous System IV: Drug Alteration of Behavior (1-3) II, K. F. Killam
Lecture—1 hour; discussion—1 hour. Prerequisite: courses 101, 102, 103 or Medical Science 410, 411B, and 413A-413B-413C, or the equivalent. Activity of drugs altering mood and behavior; psychopharmacologic agents, hallucinogens, antidepressants. Offered in odd-numbered years.

205. Advanced Pharmacology of Renal and Respiratory Systems (3) II, West
Lecture—2 hours; discussion—1 hour. Prerequisite: course 200A-200B for graduate students; Medical Science 411C and 423 for medical students. In-depth study of interaction between drugs and renal and respiratory systems with particular emphasis on pharmacologic intervention in homeostatic processes subserved by the kidney and the respiratory system.

206. Pharmacokinetics (4) I, Hendersen
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 200A, 200B, or the equivalent. Physicochemical and physiological factors effecting absorption, distribution, metabolism and excretion of drugs. Mathematical and graphical methods for determining pharmacokinetic para-

eters. Calculation of dose regimens. Laboratory analysis of drug levels in experimental animals and development of pharmacokinetic model.

207. Drug Alteration of Subcellular Function (1-3) II, Hollinger
Lecture—1 hour; discussion—1 hour. Prerequisite: course 101 or Medical Science 410 or the equivalent. The interaction of drugs and subcellular components with special emphasis on mechanism of action. Offered in odd-numbered years.

208. Application of Computers to Pharmacology (1) I, Hance; K.F. Killam, III, Stark
Lecture—1 hour. Prerequisite: consent of instructor. Presentation of basic concepts and problems.

209. Advanced Pharmacology of Cardiovascular System (3) I, West
Lecture—2 hours; discussion—1 hour. Prerequisite: course 200A-200B for graduate students; Medical Science 411B and 423 for medical students. In-depth study of action and effects of drugs on electrical and mechanical properties of mammalian heart and on mammalian vasculature.

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.

271. Clinical Pharmacology (2-10) I, II, III, IV. Winters, Ralph
Lecture; ward rounds. Prerequisite: advanced graduate students or postdoctoral fellows. Principles of pharmacology will be related to the diagnosis and treatment of drug induced disease status as well as principles of therapy of common clinical diseases. (Same course as Family Practice 271.)

297T. Tutoring in Pharmacology (1) I, II. The Staff (K.F. Killam in charge)
Discussion—1 hour; laboratory—3 hours. Prerequisite: courses 200A-200B and 200AL-200BL (with a grade of B or better) and consent of instructor. Intensive review of pharmacology through leading weekly tutorial session with a small group of students taking the sequence of 200A-200B and 200AL-200BL.

298. Group Study (1-5) I, II, III, IV. The Staff (K.F. Killam in charge)
Prerequisite: consent of instructor. Directed reading and discussion of topics in modern pharmacology.

299. Research (1-12) I, II, III, IV. The Staff (K.F. Killam in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Physical Medicine and Rehabilitation

Upper Division Courses

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Waring in charge)
Prerequisite: advanced standing and consent of instructor. Reading, conferences, field trips, laboratory experiences for upper division or master's degree candidates covering selected topics in rehabilitation and physical medicine, including biomechanics and biomedical engineering. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Waring in charge.)
Prerequisite: advanced standing and consent of instructor. Supervise independent study project and research for upper division students or graduate students. (P/NP grading only.)

Graduate Courses

201A. Sports Medicine: Medical Aspects of Sports Injuries (3) I. The Staff (Riggins, Orthopaedic Surgery, in charge)
Lecture—2½ hours; discussion—½ hour. Prerequisite: graduate students with upper division course in systemic physiology or anatomy. A multi disciplinary course introducing the student to 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. (S/U grading only.) (Same course as 401A. Physical Education 201A, Orthopaedic Surgery 401A.)

201B. Sports Medicine: Physiological Basis of Exercise Testing and Exercise Training (3) II. The Staff (Bernauer, Physical Education, in charge)
Lecture—2 hours; two 4-hour laboratory projects; discussion—four 2-hour sessions. Prerequisite: graduate students with upper division course in systemic physiology and ana-

tommy. Course introduces the student to methods and assessment of exercise physiology and exercise testing. Principles of exercise training for normal individuals and patients with various diseases and weight reduction and control will be discussed. (S/U grading only.) (Same course as 401B. Physical Education 201B, Orthopaedic Surgery 401B.)

201C. Sports Medicine: Special Problems in Prescribing and Appraising Exercise Programs (3) III. The Staff (Bernauer, Physical Education, in charge)

Lecture—2 hours; two 4-hour laboratory projects; discussion—four 2-hour sessions. Prerequisite: graduate students with upper division course in systemic physiology and anatomy. Review of special problems related to specific sports and recreational activities. Areas to be covered include SCUBA diving, backpacking, jogging and skiing as well as specific exercise programs for disabled and aged. (S/U grading only.) (Same course as 401C, Physical Education 251, Orthopaedic Surgery 401C.)

298. Selected Topics in Rehabilitation and Physical Medicine (1-5) I, II, III, IV. The Staff (Waring in charge)
Lecture-discussion-seminar-laboratory—1.15 hours; field work in rehabilitation centers and agencies. Prerequisite: consent of instructor. Open to graduate students. Group study in a variety of selected topics in Rehabilitation and Physical Medicine for Allied Health Science graduate students.

299. Research (1-12) I, II, III, IV. The Staff (Waring in charge)
Prerequisite: consent of instructor. Research on topics in the field of physical medicine and rehabilitation. (S/U grading only.)

Psychiatry

Upper Division Courses

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Tupin in charge)
Hours to be arranged. Prerequisite: advanced standing and consent of instructor. Reading, conferences, laboratory and clinical exposure in special topics in general and child psychiatry and psychology. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Tupin in charge)
Hours to be arranged. Prerequisite: advanced standing and consent of instructor. Supervised independent study project and research for upper division students. (P/NP grading only.)

Graduate Courses

***226. Psychiatric Implications of Legal Intervention** (2) I, III. Tupin, Bauer, Schuller
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. (Same courses as Community Health 226.)

250. Existential-Humanistic Psychotherapy (2) I, Battista
Seminar-discussion-practicum—2½-hour evening sessions. Prerequisite: engaged in conducting outpatient psychotherapy (concurrently). An overview of existential-humanistic approach to psychotherapy based on an existential analysis of human condition. Role-playing of psychotherapy sessions will be used to complement reading and discussions. Emphasis will be placed on work of Jim Bugental. (S/U grading only.)

251. Program Evaluation in Human Services (2) III. Edwards
Seminar—2 hours. Prerequisite: graduate standing in medical or social sciences; introductory course in statistics or consent of instructor. Course designed to provide the conceptual base and knowledge of the relevant literature to develop a basic competence as a program evaluator. Relevant examples will be drawn from the areas of medical care, mental health and social programs.

252. Computing for Clinicians (1) II. Edwards
Lecture—1 hour; laboratory—1 hour. Prerequisite: graduate standing in medical or social sciences; introductory course in statistics or consent of instructor. Introduction to the use of the interactive time-sharing computer system and the Statistical Package for the Social Sciences. Students will develop basic mastery of the maintenance and statistical analysis. (S/U grading only.)

253. Interdisciplinary Research Seminar in Family Psychology (3) I, II, III, IV. Meadow
Seminar—3 hours. Prerequisite: medical, law, or social sciences graduate students with consent of instructor. Participation in research project designed to study the relationship between family structures and communication processes and normal and abnormal behavior. Families will be selected from patient and "normal" populations, ethnic groups, and a variety of socioeconomic classes.

254. Sociology of Mental Illness (2) I, III. Rockwell
Lecture—1 hour; discussion—2 hours. Prerequisite: medical or social sciences graduate students; consent of instructor. Social and cultural aspects of mental illness; theories of "mental illness," mental illness as deviance, exploration of social and organizational responses, sociological studies of the mental hospital.

255. Death and Dying (2) II. Rockwell, Otto
Lecture—1 hour; discussion—2 hours. Prerequisite: medical student or consent of instructor. A didactic introduction to issues of death and dying. Aspects of the dying process are explored using lecture, film, video and discussion. Topics covered include stages of dying, managing death, bereavement, suicide, partial deaths, and euthanasia. (H/S/U grading only for medical students.)

257. Biological and Cultural Basis of Human Behavior (2) II. Jensen, Crain
Seminar—2 hours. Prerequisite: consent of instructor. Discussion readings of animal behavior (especially primates) and "primitive" cultures which are relevant to human behavior in our culture, including aggression, sexuality, parent roles, dominance, family and group structure. (S/U grading only.)

258. Pain Clinic Practicum (2) I, II. Pepitone-Rockwell
Seminar—1 hour; laboratory—2 hours; term paper. Prerequisite: medical students and graduate students, by consent of instructor. This course will provide students with an understanding of the social and psychological factors that affect the perception and reaction of pain.

298. Directed Group Study For Graduate Students (1-5) I, II, III, IV. The Staff (Tupin in charge)
Hours to be arranged. Prerequisite: graduate standing and consent of instructor. Special group study for graduate students in the area of mental health and illness.

299. Special Study for Graduate Students (1-12) I, II, III, IV. The Staff (Tupin in charge)
Hours to be arranged. Prerequisite: graduate standing and consent of instructor. Supervised independent study and research for graduate students. (S/U grading only.)

Professional Courses

401. Family and Marital Counseling (2) III. Rockwell, Pepitone-Rockwell
Lecture—1 hour; discussion—2 hours. Prerequisite: medical students, or consent of instructor. Principles and techniques of family and marital therapy as conducted by the helping professional. Cases will be discussed. Audiovisual examples will be used.

403. Medical Aspects of Human Sexuality (2) II, III. The Staff (Jensen in charge)
Lecture—2 hours. Prerequisite: medical and graduate students or consent of instructor. An integrated interdisciplinary study of human sexuality, its normal patterns and dysfunctions. Basic techniques of diagnosis and therapy for the general physician will be emphasized. There will be appropriate team teaching.

406. Problems in American Health Care (2) III. M.J.D. Good, B.J. Good
Seminar—2 hours. Course will focus on popular health care beliefs and institutions in American society, the politics of American health care, and the relevance of these for clinical practice and the patient-practitioner relationship.

407. Medicine in Non-Western Cultures (2) II. M.J.D. Good, B.J. Good
Seminar—2 hours. Course will review diverse forms of therapies in non-Western societies (Asian, Islamic, African) and among U.S. ethnic groups; examines the role of beliefs about physiology, disease and treatment in constructing the experience of illness.

408. Child Psychiatry: Brief Therapeutic Modalities and Principles (2) I, III. Whalen, Simmons
Seminar—1 1/2 hours. Prerequisite: consent of instructors (phone 453-3696). Seminar will focus on treatment of wide variety of child psychiatric problems, utilizing principles which have been found to be helpful in brief therapeutic contacts. Literature in this area and relevant clinical examples will be reviewed. Major emphasis will be to help participants evolve an understanding of how these principles might be useful in their own anticipated area of clinical work.

409. Child Psychiatry: Brief Therapeutic Modalities and Principles (3) I, III. Whalen, Simmons
Discussion—6 1/2 hours. Prerequisite: course 408 (may be taken concurrently); consent of instructors (phone 453-3696). Case conferences will provide direct clinical contact with at least two families over a ten-week period. Principles helpful in brief treatment of children will be emphasized. Clinical experiences will be discussed in case presentation meetings and with individual clinical supervisor. May be repeated for credit.

420. Grand Rounds for Department of Psychiatry (1) I, II, III, IV. Tupin
Prerequisite: students or staff of the School of Medicine or other qualified mental health professionals with consent of instructor. One and one-half hour weekly conference at the Sacramento Medical Center of UCD for presentation of selected clinical cases, presentation of lecture and research reports.

473. Antisocial Behavior (3-19) I, II, III, IV. Tupin, Schuler
To be arranged—variable time experience and clinical assignment and selected conferences. Prerequisite: medical and graduate students or consent of instructor. Primary focus will be work with juvenile and adult offenders in one of several settings: Sacramento County Jail, Juvenile Center for Sacramento County, or California Medical Facility. May be repeated for credit with consent of instructor.

Radiology—Diagnostic

Professional Courses

406A-406B-406C. Physics of Diagnostic Radiology (1-1-1) II-III-IV. Weinschelbaum, Farrer
Lecture—1 hour. Prerequisite: one-year college physics course for non-engineering students (e.g., Physics 2A-2B-2C, 3A-3B-3C) or consent of instructor. Subjects discussed are from fields of basic radiologic physics, physics of diagnostic radiology, and physics of nuclear radiology. Offered at VA Hospital, Martinez. (P/NP grading only for undergraduates; S/U grading for graduate students.)

498. Group Study in Diagnostic Radiology (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor.

499. Research in Diagnostic Radiology (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor.

Radiology—Nuclear Medicine

Upper Division Courses

101. Biomedical Radiochemistry (3) III. S. J. DeNardo, Krohn
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. J. DeNardo in charge)
Lecture—1 hour; reading—2 hours. Prerequisite: upper division standing and consent of instructor. Selected reading in nuclear medicine. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (G. L. DeNardo in charge)
Laboratory—3-15 hours. Prerequisite: upper division standing and consent of instructor. Students will learn the scientific approach and laboratory techniques pertaining to biophysical investigation in the Nuclear Medicine Laboratory. (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. Supervised independent study and research for graduate students. (S/U grading only.)

Professional Courses

400A. Fundamental Nuclear Medicine (4) I, Krohn, Hines, G. L. DeNardo (in charge)
Lecture—3 hours; laboratory—2 hours. Prerequisite: consent of instructor. Course is intended to cover in a comprehensive didactic and practical fashion those fundamental and clinical sciences which are the basis for the practice of nuclear medicine and nuclear medical technology.

400B. Fundamental Nuclear Medicine (4) II. S. J. DeNardo, Berman, Stadelnik, G. L. DeNardo (in charge)
Lecture—3 hours; laboratory—2 hours. Prerequisite: consent of instructor. Course is intended to cover in a comprehensive, didactic and practical fashion those fundamental and clinical sciences which are the basis for the practice of nuclear medicine and nuclear medical technology.

401. Biomedical Radiochemistry (3) III. S. J. DeNardo, Krohn, Chen
Lecture—2 hours; laboratory—3 hours. Prerequisite: open to graduate students; consent of instructor. Course is de-

signed 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.)

498. Group Study in Nuclear Medicine (1-12) I, II, III, IV. The Staff (Raventos in charge)
Prerequisite: consent of instructor.

499. Research in Nuclear Medicine (1-12) I, II, III, IV. The Staff (Raventos in charge)
Prerequisite: consent of instructor.

Radiology—Radiological Physics

Professional Course

405A-405B-405C. Radiological Physics of Diagnostic Radiology (1-1-1) I, II, III. Heintz
Lecture—1 hour; laboratory—1 hour. Prerequisite: residents in Radiology, Veterinary radiology, graduate or medical students; consent of instructor. An introductory course in the radiological physics of diagnostic radiology. Subjects discussed include elementary atomic physics production of X radiation, and the physics of diagnostic radiographic procedures. Course taught at Sutter Radiation Therapy Center. (S/U grading only for graduate students.)

Radiology—Therapeutic

Graduate Course

299. Independent Study and Research (1-12) I, II, III, IV. The Staff (Raventos in charge)
Laboratory—9-12. Prerequisite: enrollment with Biophysics Group for Ph.D. candidacy, and consent of group adviser and sponsor. Research under supervision of a member of the department (sponsor). Work must be appropriate to fulfill the requirements for the Ph.D. degree. (S/U grading only.)

Professional Courses

490. Medical Literacy (2) III. Raventos, Monroe
Lecture—1 hour; seminar—1 hour. Prerequisite: consent of instructor. For medical students and hospital residents. Writing and interpreting papers; most examples from current medical literature.

498. Group Study in Therapeutic Radiology (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor.

499. Research in Therapeutic Radiology (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor.

Medicine

(School of Veterinary Medicine)

Murray E. Fowler, D.V.M., Chairperson of the Department
Department Office, 2106 Medical Science 1A
(752-1363)

Faculty

Alexander A. Ardans, D.V.M., M.S., Associate Professor
Kurt Benirschke, M.D., Clinical Professor (San Diego Campus)
Dale L. Brooks, D.V.M., Ph.D., Lecturer
Gary P. Carlson, D.V.M., Ph.D., Associate Professor
Larry D. Cowgill, D.V.M., Ph.D., Assistant Professor
Laurence R. Enos, Pharm.D., Lecturer
Murray E. Fowler, D.V.M., Professor
Roy V. Henrikson, D.V.M., Lecturer
Charles A. Hjerpe, D.V.M., Professor
Peter J. Ihrke, V.M.D., Assistant Professor
Humphrey D. Knight, D.V.M., Ph.D., Professor

Medieval Studies

Gerald V. Ling, D.V.M., Associate Professor
Donald G. Low, D.V.M., Ph.D., Professor
Blaine McGowan, Jr., D.V.M., Professor
Niels C. Pedersen, D.V.M., Ph.D., Associate Professor
William R. Pritchard, D.V.M., Ph.D., J.D., Professor
Livio G. Raggi, D.V.M., Ph.D., Professor Emeritus
Sigmund T. Rich, D.V.M., Lecturer
Edward A. Rhode, D.V.M., Professor
Gary E. Rumbaugh, D.V.M., Assistant Professor
Charles J. Sedgwick, D.V.M., Assistant Professor
Bradford P. Smith, D.V.M., Assistant Professor
Anthony A. Stannard, D.V.M., Ph.D. Associate Professor (*Medicine, Pathology*)
Donald R. Strombeck, D.V.M., Ph.D., Professor
William P. Thomas, D.V.M., Assistant Professor
James F. Wilson, D.V.M., J.D., Assistant Adjunct Professor

Part-Time Clinical Faculty

Paul S. Chaffee, D.V.M., Assistant Clinical Professor
Lanny H. Cornell, D.V.M., Assistant Clinical Professor
Stephen J. Ettinger, D.V.M., Associate Clinical Professor
Norman L. Gates, D.V.M., M.P.H., Assistant Clinical Professor
Gary R. Kuehn, D.V.M., Assistant Clinical Professor
Robert R. Pensinger, D.V.M., Associate Clinical Professor
Phillip T. Robinson, D.V.M., Assistant Clinical Professor
James D. Russell, D.V.M., Assistant Clinical Professor

Courses in Medicine

Upper Division Course

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Fowler in charge) (P/NP grading only.)

Graduate Courses

***290. Seminar in Veterinary Medicine** (1) I, II, III. The Staff (Fowler in charge)

298. Group Study (1-5) I, II, III. The Staff (Fowler in charge) 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 (Fowler in charge) (S/U grading only.)

Professional Courses

401. Small Animal Clinics (1½ per week) I, II, III. The Staff (Ling in charge) Laboratory—50 hours total. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns 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 (1½ per week) I, II, III. The Staff (Knight in charge) Laboratory—50 hours total. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, or consent of instructor. Interns and residents responsible for the medical care of patients in the VMTH 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 (1½ 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.)

404. Herd Health Management (1½ per week) I, II, III. Hjerpe and McGowan in charge Laboratory—50 hours total. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns 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.)

421. Veterinary Dermatology (¾ per week) I, II, III. Stannard Laboratory—25 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns and 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** (¾ per week) I, II, III. Gillespie 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 (¾ per week) I, II, III. Fowler Laboratory—25 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns 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.)

491. Small Animal Grand Rounds (¾) 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. Interns and 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 (½) I, II, III. The Staff (Knight in charge) Discussion—1 hour. Prerequisite: professional standing; intern or resident in Veterinary Medical Teaching Hospital or consent of instructor. Interns and 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 (Ling in charge) Seminar—2 hours. Prerequisite: professional standing; intern or 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. Interns and residents will assist in the presentation of seminar material. May be repeated for credit. (S/U grading only.)

Medieval Studies

(College of Letters and Science)

Program Office, 912 Sproul Hall (752-1219)

Committee in Charge

James J. Murphy, Ph.D. (*Rhetoric*), Committee Chairperson

William M. Bowsky, Ph.D. (*History*)

*Robert O. Crummev (*History*), Winter-Spring

Quarters

Dennis J. Dutschke, Ph.D. (*Italian*)

Manfred P. Fleisher, Ph.D. (*History*), Fall Quarter

Winder McConnell, Ph.D. (*German*)

Robert K. Sarlos, Ph.D. (*Dramatic Art*)

David A. Traill, Ph.D. (*Classics*)

The Major Program

The major in Medieval Studies is designed to introduce you to the main features of European civilization during the period from the fall of Rome to the beginnings of the Renaissance. Medieval studies are inherently interdisciplinary. The program involves studies in history, art, philosophy, literature, drama, music, national languages, religion, rhetoric, and political theory.

Medieval Studies

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 Matter

History, at least 12 units from History 102B,

121A, 121B, 121C, 201B

Literature: at least 16 units, including two

courses from each of two of the following

(a) English 111, 112, 113, 150A, 188,

189.

(b) French 115A, 115B.

(c) German 120, 121, 122.

(d) Italian 113A, 113B, 115A, 115B,

139A, 139B.

(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, 110

Arts and language, at least 8 units from Art

176A, 176B, 176C, 177A, 178A, 178B;

Dramatic Art 156, German 106; Music

114 (note prerequisite), 199; Rhetoric

110, 111

Political thought, at least one course from

Political Science 115, 116, 118A

Senior thesis, Medieval Studies 190

Total Units for the Major 52

Major Advisers. W. M. Bowsky (*History*), D. J. Dutschke (*Italian*), J. J. Murphy (*Rhetoric*), D. A. Traill (*Classics*).

Courses in Medieval Studies

Lower Division Courses

20A. Early Medieval Culture (4) I. The Staff 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*.

20B. The Culture of the High Middle Ages (4) III. The Staff 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.

***20C. Medieval Transformations** (4) III. The Staff 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.

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.

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.)

Mexican-American (Chicano) Studies

(College of Letters and Science)

Adaljiza S. Riddell, Ph.D., Program Director
Program Office, 211 North Hall (752-2428)

Committee in Charge

Barbara J. Merino, Ph.D. (*Education*), Committee Chairperson
Luis L. Arroyo, Ph.D. (*History*)
Richard A. Figueroa, Ph.D. (*Education*)
Douglas L. Minnis, Ed.D. (*Education*)
Adaljiza S. Riddell, Ph.D. (*Chicano Studies*)
Refugio I. Rochin, Ph.D. (*Agricultural Economics*)
^{2,3}Guillermo Rojas, Ph.D. (*Spanish*),
Winter-Spring Quarters

Faculty

Adaljiza S. Riddell, Ph.D., Lecturer

The Major Program

The interdepartmental major now allows for two emphases, one in humanities and the other in sociology. The *humanities* track introduces the student to the Spanish language, linguistics, Mexican and Mexican-American history, culture and literature, and social sciences. This curriculum allows for flexibility to accommodate primary interests in bilingual education, community or social service, or advanced professional preparation. The *sociology* track combines traditional courses in sociology with substantive area courses that deal intensively with the Mexican-American experience. The sociology emphasis promotes a greater understanding of the social, political, and cultural life of Mexican-American people, and it provides a solid basis of knowledge for those who wish to work in a bi-cultural setting. It is designed for students interested in public service careers such as law school, graduate school, public administration, or community groups.

Students who have demonstrated language fluency in Spanish through the placement examination can accelerate their program considerably; thus the language placement examination is strongly recommended to all students entering the program.

NOTE: For key to footnote symbols, see page 130

Mexican-American (Chicano) Studies

A.B. Major Requirements:

Humanities Emphasis

	UNITS
Preparatory Subject Matter	8-40
Spanish 1 or 1ATA, 2 or 2ATA, 3; (or the equivalent)	0-18
Spanish 4 or 7A, 5 or 7B, 28 or 7C	0-14
Linguistics 1	4
Chicano Studies 10	4
Depth Subject Matter	38-40
Spanish 124, 126, 129, 135	16
One course from Spanish 131, 132, 133	3-4
One course from Linguistics 115, 150 or Education 151	3-4
History 169A, 169B; 166A or 166B	12
Political Science 168	4

Total Units for the Major 46-80

Recommended

Linguistics 115 and 150 (above), American Studies 45; two courses from Spanish 8A, 8B, 9 (for non-native speakers of Spanish); English 2 (for native speakers of Spanish); two courses from American Studies 110, Sociology 124, 130; Anthropology 104, 105A, 139B; Spanish 108B, 132 and 133 (above), 300.

Sociology Emphasis

	UNITS
Preparatory Subject Matter	32-34
Chicano Studies 10	4
Spanish 4 or 7A, 5 or 7B, 28 or 7C	11-13
Sociology 1, 46A, 46B	13
Linguistics 1	4

Depth Subject Matter	42
Sociology 130, 140, 165A, 169	16
Agricultural Economics 150	3
History 169B	4
Linguistics 115	3
Political Science 168	4
Electives, a maximum of 12 units chosen from any of the following courses with no more than 2 courses from any one group	12
Group 1: History 166A, 166B, or 169A	
Group 2: Linguistics 150, Spanish 124, 126	
Group 3: Anthropology 163, Sociology 118	
Group 4: Applied Behavioral Sciences 172, 176, Political Science 176.	

Total Units for the Major 74-76

Further Study. If you are contemplating studies in a graduate or professional school you can, with the aid of an adviser, build a program around the discipline of your choice, i.e., Spanish or Spanish-American literature, history, or political science. If you are contemplating a career in bilingual education you should consult the Department of Education for information about the Teacher Credential Program (see also page 105).

Major Adviser. L. L. Arroyo (*History*), D. M. Ramirez (*Sociology*), A. S. Riddell (*Chicano Studies*), G. Rojas (*Spanish*).

Minor Program Requirements:

This interdepartmental minor provides the student with a general view of the Chicano in terms of the history, culture, political involvement and role in the society of the Southwestern United States.

	UNITS
Mexican-American (Chicano) Studies	24
Chicano Studies 10	4
History 169A or 169B	4
Spanish 124	4
Political Science 168	4
At least 8 units of electives from Education 116, 151; History 169A or 169B (not to duplicate one of the above); Linguistics 115; Sociology 142	8

Courses in Chicano Studies

Lower Division Courses

10. Introduction to Chicano Studies (4) III. Riddell Lecture—3 hours; discussion—1 hour. Analysis of the situation of the Chicano (Mexican-American) people, emphasizing their history, literature, political movements, education and related areas.

98. Directed Group Study (1-5) I, II, III. The Staff (Riddell in charge) (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Riddell in charge) (P/NP grading only.)

Upper Division Courses

102. Chicanas in Contemporary Society (4) III. Riddell Lecture—3 hours; term paper. Prerequisite: course 10 or Spanish 124 or History 169B. Analysis of the role and status of Chicanas in contemporary American society. Special emphasis is on their historical role, the political, economic and social institutions which have affected their status, and their contributions to society and their community.

198. Directed Group Study (1-5) I, II, III. The Staff (Riddell 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 (Riddell in charge) Prerequisite: upper division standing and consent of Program Chairperson. (P/NP grading only.)

Microbiology

See Also Medical or Veterinary Microbiology

Microbiology (A Graduate Group)

David Pratt, Ph.D., Chairperson of the Group
Group Office, 156 Hutchison Hall (752-0262)

Graduate Study. The Graduate Group in Microbiology offers study and research leading to the M.A. and Ph.D. degrees. For information on the graduate study and undergraduate preparation for the program contact the graduate adviser or the Chairperson of the group. See also page 99.

Graduate Advisers. B. L. Beaman (*Medical Microbiology*); Y. C. Zee (*Veterinary Microbiology*); P. Baumann (*Bacteriology*); M. W. Miller (*Food Science and Technology*).

Course in Microbiology

Graduate Course

299. Research (1-12) I, II, III. The Staff Laboratory—variable. Research under the guidance of dissertation committee. (S/U grading only.)

Military Science

(College of Letters and Science)

Philip J. Perles, Lieutenant Colonel, Chairperson
of the Department
Department Office, 125 Hickey Gymnasium
(752-0541)

Faculty

William L. Carwile, Major, Assistant Professor
Mark J. Donald, Captain, Assistant Professor
Jay D. Johnson, Major, Associate Professor
Young C. Lim, Captain, Assistant Professor
George J. Mikosz, Captain, Assistant Professor
Paul Payette, Major, Associate Professor
Philip J. Perles, Lieutenant Colonel, Professor
William Treece, Captain, Assistant Professor

Program of Study

The Military Science Department extends the educational opportunities and provides extracurricular activities which, when combined with a baccalaureate degree, qualify a student for a commission in the Army Reserve or Regular Army. The program assists qualified students in all academic fields to prepare for positions of leadership in military or civilian careers. A continuing effort is made to assign graduates to military career fields aligned with their major field of study, individual capabilities and preferences. Active duty obligation for ROTC graduates will not exceed three years for those who choose Active Duty or six months for those who choose Reserve Component Duty. A liberal scholarship program is available. The Army offers four-, three-, and two-year scholarships. The four-year is awarded to high school seniors who will be freshmen at U.C. Davis. The three-year and two-year are awarded to freshmen and sophomores who are already attending college. Application for the four-year scholarship is completed prior to December 15th of the senior year in high school. The three-year and two-year scholarship applications are made during March of the freshmen or sophomore year.

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.

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 textbooks, uniforms and equipment are provided without cost. Students are given leadership development experience at summer 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 which is volun-

tary and carries no military obligation. Applicants are paid for camp attendance and transportation costs. Applications are accepted during winter term 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. Other methods for entering the upper division program are available by arrangement with the department.

Scholarship Program

Four-year merit scholarships are awarded to high school seniors in nationwide competition. One-, two-, and three-year scholarships are applied for through the Military Science Department after entering the University. Scholarship winners receive all tuition, fees, books, uniforms, and \$100 subsistence allowance per month.

Scholarship students incur a four-year active duty military obligation.

For further details on these scholarships contact the department.

Leadership Laboratory

During the course of the school year seven Saturdays are spent in the conduct of practical exercises. These are voluntary for lower division students. Classes emphasize adventure activities including mountaineering techniques, orienteering, and rifle marksmanship. Upper division students are required to attend leadership laboratories for practical leadership experience and to prepare for attendance at ROTC Advanced Camp.

Air Force ROTC

The UC Davis campus does not offer Air Force ROTC; however, the Department of Aerospace Studies (AFROTC) on the UC Berkeley campus offers upper division students the opportunity to qualify for a commission in the Air Force through cross registration at Berkeley.

Students contemplating application for this two-year program must have two years of academic studies (undergraduate, graduate or a combination) remaining with the University following the summer in which they intend to complete the AFROTC Field Training. Application should be made as early as possible in the academic year preceding the summer training period.

Two-year scholarships are available to qualified students. Tuition, fees, book allowance, and a \$100 monthly living allowance is paid all recipients.

Students qualified for, and desirous of flight training as an Air Force officer will be provided training without charge during their final year in the AFROTC program.

Selection for the two-year program is based upon aptitude and interest in becoming an Air Force officer, and potential for leadership and command. Entrance is also subject to the approval of the Department Chairperson. Those students accepted into the Professional Officer Course are provided with uniforms, texts and \$100 per month.

For details on the program, contact the Department staff, 10 Callaghan Hall, University of California, Berkeley 94720, or telephone (415) 642-3572. For information on cross-enrollment procedures, contact the Admissions Office on this campus.

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 individual 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

Lower Division Courses

11. Introduction to Military Science I (1) I. Mikosz
Lecture—1 hour. A discussion of the military as an element of national security and international diplomacy. Course surveys the United States defense structure to include military treaties and organizations.

12. Introduction to Military Science II (1) II. Mikosz
Lecture—1 hour. A discussion of the military's role in American society. Course focuses on current social attitudes within the military and discusses technological developments of modern military forces.

13. Introduction to Military Science III (1) III. Mikosz
Lecture—1 hour. A survey of the organization and structure of the United States Army. Course includes discussions of various branches of the Army, their roles in the overall organization, and their interface with one another.

21. Military History I (2) I. Lim
Lecture—2 hours. An analysis of selected historical military campaigns and battles. Emphasis is on continuity of principles of warfare throughout the ages. Course covers period from Graeco-Persian Wars to Age of Louis XIV.

22. Military History II (2) II. Lim
Lecture—2 hours. Survey of selected campaigns and battles from American Revolution era to end of nineteenth century. Emphasis is on the foundation and development of modern American and European military organizations.

23. Military History III (2) III. Lim
Lecture—2 hours. An analysis of modern military conflict from World War I to present. Emphasis is on development of mechanized warfare and its impact on current world-wide military doctrine.

Upper Division Courses

131. Principles of Military Instruction (2) I. Treece
Lecture—2 hours. Principles and practice in fundamentals applicable to military instruction to include planning, presentation and evaluation. Student presentations exemplify lecture material.

132. Theory of Leadership (2) II. Perles
Lecture—2 hours. Principles and theory of leadership, individual and group solution of leadership problems common to small groups.

133. Advanced Military Operations (2) III. Payette
Lecture—2 hours. Prerequisite: course 23 or consent of instructor. Advanced study of military operations, to include an analysis of the functions of primary and supporting branches and commands.

141. Principles of Military Administration (2) I. Johnson
Lecture—2 hours. Discussion of the functions of military staff organizations to include military briefings, correspondence, procedures, and the system of military justice.

142. Managerial Principles and Theories (2) II. The Staff
Lecture—2 hours. Military administrative principles and personnel management theories, including the military occupational structure, and the administration of military justice.

143. Revolutionary Conflict (2) III. The Staff
Lecture—2 hours. Analysis of revolutionary conflict to include an examination of insurgency and counterinsurgency movements in the world arena.

Music

(College of Letters and Science)

D. Kern Holoman, Ph.D., Chairperson of the Department
 Department Office, 112 Music Building
 (752-0666)

Faculty

Lawrence E. Anderson, Ph.D., Lecturer
 Robert S. Bloch, M.A., Associate Professor
^{2,3}Sydney R. Charles, Ph.D., Professor
 Andrew D. Frank, M.A., Associate Professor
 D. Kern Holoman, Ph.D., Associate Professor
 Gilbert Kalish, B.A., Visiting Professor
 Albert J. McNeil, M.S., Professor
 David L. Nutter, Ph.D., Assistant Professor
 Jerome W. Rosen, M.A., Professor
²Richard G. Swift, M.A., Professor
 William E. Valente, M.A., Associate Professor

The Major Program

The Department of Music offers a unique program of study for a career in music as part of a broadly-based liberal arts education leading to the Bachelor of Arts degree.

The student engages in the study and performance of music of all styles and periods including those of the present. Options are provided for those students with special interests in composition, history, teaching and performance, and for those who plan to continue in graduate work in music. The Department of Music offers a Master of Arts degree with emphasis on composition or music history, and a Master of Arts in Teaching degree with emphasis on the teaching of music.

Music

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	42
Music 4A, 4B, 4C, 5A, 5B, 5C, 21A, 21B, 21C	39
Music 30 (or the equivalent as determined in consultation with major adviser), one year	3
Depth Subject Matter	36
Music 104A, 104B, 104C	12
Music 130 (or the equivalent as determined in consultation with major adviser), one year	3
At least 20 units selected from Music 107A, 107B, 107C, 108A, 108B, 111, 112, 113A, 113B, 114, 115, 116, 117, 118, 119, 198 or 199. Of these 20 units a minimum of 14 units must be from course series 113A-119	20
At least 1 additional upper division unit in Music to achieve a total of 36 upper division units (may include upper division performance course)	1
Performance	14
At least 14 units from Music 41, 43, 44, 45, 46, 141, 143, 144, 145, 146.	
Piano Skills	3
Music 405A, 405B, 405C (required of students with a deficiency in piano playing).	
Total Units for the Major	92-95

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

NOTE: For key to footnote symbols, see page 130.

be required to complete the Music 405 sequence. 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: a reading knowledge of French or German for the M.A. degree in both composition and musicology. Undergraduates contemplating advanced study in music should prepare to satisfy these requirements as they proceed to the bachelor's degree.

Major Advisers. A. D. Frank, W. E. Valente.

Minor Program Requirements:

	UNITS
Music	18
A minimum of eighteen units of upper division Music courses	18
Must include a maximum of six units of performance courses (130, 141, 143, 144, 145, 146).	
The remaining units are to be selected from Music 104A, 104B, 104C, 107A, 108A, 108B, 110A, 110B, 111, 112, 113A, 113B, 114, 115, 116, 117, 118, 119, and 198.	

Teaching Credential Subject Representative. A. J. McNeil. See page 105 for the Teacher Education Program.

Graduate Study. The Department of Music offers programs of study and research leading to the M.A. and M.A.T. degrees. Detailed information regarding graduate study may be obtained from the Graduate Adviser.

Graduate Adviser. R. G. Swift.

Courses in Music

Lower Division Courses

- 1. Basic Musicianship** (3) II, III. Anderson
 Lecture—3 hours. Fundamentals of music, singing, ear-training and conducting for prospective classroom teachers.
- 3A. Introduction to Music Theory** (4) I, Frank; II, Swift; III, Frank
 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. Course 3A is prerequisite to course 3B. Intended for the general student.
- 3B. Introduction to Music Theory** (4) II, Frank; III, Swift
 Lecture—3 hours; laboratory—1 hour. Continuation of course 3A. Intended for the general student.
- 4A-4B-4C. Elementary Theory** (5-5-5) I-II-III. Bloch
 Lecture—5 hours. Development of writing and listening techniques through the study of music fundamentals; ear-training, beginning tonal counterpoint and harmony; keyboard harmony; score reading; analysis of repertory. Intended primarily for music majors and minors.
- 5A-5B-5C. Intermediate Theory** (4-4-4) I-II-III. Valente
 Lecture—4 hours. Prerequisite: course 4C. Intermediate tonal counterpoint and harmony.
- 10. Introduction to Musical Literature** (4) I, Rosen; II, Frank; III, Nutter
 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.
- 21A-21B-21C. History and Literature of Music** (4-4-4) I-II-III. Nutter
 Lecture—3 hours; listening section—1 hour. Prerequisite: course 4C. The history of music from antiquity to the present.
- *28. Introduction to Afro-American Music** (4) III. McNeil
 Lecture—3 hours; listening and discussion—1 hour. A study of the Afro-American rhythm, field hollers, work song, spirituals, blues, gospel, and jazz; the contrast between West African, Afro-Caribbean, and Afro-Cuban musical traditions.
- 29. Music in World Culture** (4) III. McNeil
 Lecture—3 hours; listening—1 hour. Introduction to the musical repertoires of non-Western cultures. Comparative

study of selected musical instruments, melodic and rhythmic styles and structures, and the social role of music in non-Western societies.

- 30. Applied Study of Music Literature: Intermediate** (1) I, II, III. The Staff (Holoman in charge)
 Performance instruction—1 hour. Prerequisite: admission by audition only; ability to perform scales and short compositions from the standard repertory required. Class instruction, arranged by section, in the standard orchestral instruments, or in voice. Required for music majors; recommended for those preparing for a teaching credential in music. 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.)
 - 43. University Concert Band** (2) I, II, III. Valente
 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. McNeil
 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** (2) I, II, III. Bloch in charge
 Rehearsal—3 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 (Holoman in charge)
 (P/NP grading only.)
- ### Upper Division Courses
- 104A-104B-104C. Advanced Theory** (4-4-4) I-II-III. Rosen
 Lecture—4 hours. Prerequisite: course 5C. Twentieth-century compositional procedures: analyses and projects in composition.
 - 107A-107B-107C. Electronic Music** (2-2-2) III. Rosen
 Laboratory—6 hours. Prerequisite: consent of instructor; limited enrollment with priority to music majors. Composition of electronic music using the Buchla synthesizer. (Only 2 units count toward the music major.)
 - 108A-108B. Orchestration** (2-2) II-III. Rosen
 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.
 - 110A. The Music of a Major Composer: Beethoven** (4) II. Holoman
 Lecture—3 hours; listening section—1 hour. The work of Beethoven will be studied in the context of his time and his contemporaries. Lectures, listening sections, and selected readings. For non-majors. Offered in odd-numbered years.
 - *110B. The Music of a Major Composer: Mahler** (4) II. Frank
 Lecture—3 hours; listening section—1 hour. The work of Mahler will be studied in the context of his time and his contemporaries. Lectures, listening sections, and selected readings. For non-majors. Offered in even-numbered years.
 - 110C. The Music of a Major Composer: Bach** (4) III. Swift
 Lecture—3 hours; listening—1 hour. Work of Bach will be studied in the context of his time and his contemporaries. Lectures, listening sections, and selected readings. For non-majors.
 - 110D. The Music of a Major Composer: Mozart** (4) I. Frank
 Lecture—3 hours; listening—1 hour. Work of Mozart will be studied in the context of his time and his contemporaries. Lectures, listening sections, and selected readings. For non-majors.
 - 111. Choral Conducting** (2) II. McNeil
 Lecture—2 hours. Prerequisite: course 5C. Study of the principles and techniques of conducting choral ensembles.

Native American Studies

112. Instrumental Conducting (2) III. Holoman
Lecture—2 hours. Prerequisite: course 5C. Principles and techniques of conducting instrumental ensembles.

***113A. Music of Non-Western Civilizations** (2) II. Charles
Lecture—2 hours; listening—1 hour. Prerequisite: course 21A. Study of the native music of Asia. Offered in even-numbered years.

***113B. Music of Non-Western Civilizations** (2) III. McNeil
Lecture—2 hours; listening—1 hour. Prerequisite: course 21A. Study of the native music of Africa and the Western Hemisphere. Course 113A is not prerequisite to 113B. Offered in even-numbered years.

114. Music of the Middle Ages (4) III. Charles
Lecture—3 hours; listening laboratory—1 hour, plus additional listening. Prerequisite: course 21. Studies in the music and styles of the Middle Ages. Not offered every year.

***115. Music of the Renaissance** (4) III. Charles
Lecture—3 hours; listening laboratory—1 hour, plus additional listening. Prerequisite: course 21. Studies in the music and styles of the period from 1430-1600. Not offered every year.

116. Music of the Baroque Period (4) II. Holoman
Lecture—3 hours; listening laboratory—1 hour, plus additional listening. Prerequisite: course 21. Studies in the music and styles of the period from Monteverdi to Handel and J.S. Bach. Not offered every year.

***117. Music of the Classical Period** (4) I, Swift
Lecture—3 hours; listening laboratory—1 hour, plus additional listening. Prerequisite: course 21. Studies in the music and styles of the eighteenth century. Not offered every year.

***118. Music of the Romantic Period** (4) I. Holoman
Lecture—3 hours; listening laboratory—1 hour, plus additional listening. Prerequisite: course 21. Studies in the music and styles of the nineteenth century. Not offered every year.

119. Music of the Twentieth Century (4) II. Swift
Lecture—3 hours; listening laboratory—1 hour, plus additional listening. Prerequisite: course 21. Studies in the music and styles of the twentieth century. Not offered every year.

130. Applied Study of Music Literature: Advanced (1) I, II, III. The Staff (Holoman in charge)

Performance instruction—1 hour. Prerequisite: admission by audition only; ability to perform scales and short compositions from the standard repertory required. Class instruction, arranged by section, in the standard orchestral instruments, or in voice. Required for music majors; recommended for those preparing for a teaching credential in music. 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.)

143. University Concert Band (2) I, II, III. Valente
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. McNeil
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 (2) I, II, III. Bloch in charge
Rehearsal—3 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.)

198. Directed Group Study (1-5) I, II, III. The Staff (Holoman in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Holoman in charge)
(P/NP grading only.)

Graduate Courses

200A-200B. Music Research (4-4) III. Charles
Seminar—3 hours. Survey of basic materials for music research. Selected projects.

***200C. Notation** (4) III. Charles
Seminar—3 hours. Study of selected notation practices.

***203A-203B-203C. Composition** (4-4-4) I-II-III. Swift
Seminar—3 hours. Technical projects and free composition.

***240A-240B-240C. Techniques of Analysis** (4-4-4) I, II, III. Holoman in charge
Seminar—3 hours. Analysis and analytical techniques as applied to music of all historical style periods.

***291A-291B-291C. Topics in Music History** (4-4-4) I-II-III. Charles in charge
Seminar—3 hours. Studies in selected areas of music history and theory.

299. Individual Study (2-5) I, II, III. The Staff (Holoman in charge)
Special studies and projects in musical composition or music history (S/U grading only.)

Teaching Methods Courses

Instrumental Methods. The courses in this series consider methods of teaching orchestra and band instruments, and include repertory and program planning for secondary schools.

300. The Teaching of Music (3) II. Anderson
Lecture—3 hours. Prerequisite: course 1 or the equivalent. Methods of teaching music in grades K-6.

301. The Teaching of Music (3) I, McNeil
Lecture—3 hours. Prerequisite: course 5C (or the equivalent). Methods of teaching music in grades 7-12.

321A-321B. Stringed Instruments (1-1) II-III
Discussion—2 hours. Prerequisite: course 4C.

322. Brass Instruments (2) III. Anderson
Discussion—2 hours. Prerequisite: course 4C.

***323A-323B. Woodwind Instruments** (1-1) II-III. Anderson
Discussion—2 hours. Prerequisite: course 4C.

Professional Course

405A-405B-405C. Elementary Piano (1-1-1) I-II-III.
Laboratory—2 hours. Prerequisite: limited enrollment, with priority given to music majors. Designed for students requiring training to meet the minimal piano requirements for the major in music. (P/NP grading only.)

Native American Studies

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Applied Behavioral Sciences.

The Major Program

The Native American Studies major is designed to affect the lives of American Indian people as directly as possible. In order to accomplish this the major is designed to prepare you to: (1) work with Indian people as community service personnel, teachers, tribal administrators, etc.; (2) understand Indian values and problems; (3) develop data and creative products directly usable by Indian people or by schools and agencies serving Indian people; (4) apply results of past experiences or research to finding solutions to the many problems faced by Indian communities; (5) further creative development of Indian people through innovations within the context of Indian artistic and musical traditions; and (6) enter into graduate programs either in Native American Studies or in related fields. In consultation with the Native American Studies Major

Review Committee, you will select the course sequence most appropriate for your educational goals. A minimum of 20 units shall be in a primary field of specialization.

Native American Studies

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.)

	UNITS
Preparatory Subject Matter	36
Introduction to native American studies	
(Native American Studies 1)	4
Native American experience (Native American Studies 20)†	4
Native American art (Native American Studies 33)†	4
<i>Inquiry courses</i> which develop intellectual skills in: scientific methods, research methods, statistics, logical thinking, and systems analysis	4
<i>Creative expression courses</i> which explore and develop creative powers (e.g., art, music, design, etc.)	4
<i>Personal and social behavior courses</i> which build an understanding of the dynamics of human relationship from the individual to the international level (e.g., psychology, sociology, anthropology, literature, communication, etc.)	8
<i>Ecological and environmental studies courses</i> which build an understanding of the dynamic interaction of man and man's environment (e.g., life science, earth science, environmental science, etc.)	8
Depth Subject Matter	69
Native American ethno-history (Native American Studies 130A-130B-130C)	12
Native American community development (Native American Studies 161A)	4
Field experience in native American studies (Native American Studies 195)	12
Native American studies senior project (Native American Studies 196)	5
Individualized program to be determined by the student and the Native American Studies Major Review Committee (a minimum of 20 units shall be in a primary field of specialization)	36
Breadth Subject Matter	32
Additional inquiry courses	8
Additional creative expression courses	8
Additional personal and social behavior courses	4
Additional ecological and environmental studies courses	4
Additional units from the above four categories	8
Unrestrictive Electives	43
Total Units for the Major	180

Major Adviser. J.H. Adams.

Related Undergraduate Major. Concentration in Native American Studies is also available through the Applied Behavior Sciences major.

American History and Institutions. This University requirement can be satisfied by any one of the following Native American Studies courses: 20, 116, 130A, 130B, 130C, 155. (See also page 61.)

Courses in Native American Studies

Lower Division Courses

1. Introduction to Native American Studies (4) I, II, III. Rising
Lecture—3 hours; discussion—1 hour. Introduction to U.S. Indian tribal-reservation culture; relationships of Native American Studies to other academic disciplines.

†Students may substitute other Native American Studies courses with the approval of the Native American Studies Major Review Committee.

20. The Native American Experience (4) III. Adams
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. An 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.

***32A. Native American Music and Dance** (4) I, Rising
Lecture—1 hour; discussion—3 hours. Prerequisite: course 1 or 20 or consent of instructor. Introduction to the music and dance of the native peoples of the U.S. Students will study appropriate nonreligious songs and dances.

32B. Native American Music and Dance (4) I, Rising
Lecture—1 hour; discussion—3 hours. Prerequisite: course 1 or 20 or consent of instructor. Continuation of course 32A. Introduction to music and dance of the native peoples of California and the west. Students will study appropriate nonreligious songs and dances.

33. Native American Art in the U.S. (4) I, Longfish
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Introduction to the cultural-historical significance and practical application of Native American art in the U.S. area, with emphasis on the Southwest.

34A. Native American Art Workshop (4) I, Longfish
Lecture—1 hour; laboratory—6 hours; 3 hours to be arranged. Prerequisite: consent of instructor; course 33 recommended. Studio projects in Native American art.

34B. Native American Art Workshop (4) II. Longfish
Lecture—1 hour; laboratory—6 hours; 3 hours to be arranged. Prerequisite: consent of instructor; course 33 recommended. Studio projects in Native American design in textiles, weaving, and weaving apparel.

34C. Native American Art Workshop (4) III. Longfish
Lecture—1 hour; laboratory—6 hours; 3 hours to be arranged. Prerequisite: consent of instructor; course 33 recommended. Studio projects in Native American design in leather, beadwork, miscellaneous crafts.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Rising in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Contemporary Indian Art (4) II. Longfish
Lecture—3 hours; discussion—1 hour. Prerequisite: course 33 or consent of instructor. Contemporary Indian art and the influences that affect Native American artists today.

106. Native Cultures of the Northern Plains (4) II. Adams
Lecture—3 hours; discussion—1 hour. Prerequisite: course 20 or consent of instructor. Introduction to the cultures and history of the Indian Nations of the Northern Plains region with emphasis upon the area from Alberta to Colorado. Intertribal relations and white-Indian relations will both be considered.

***110. Fundamentals of Native American Education** (4) II. Adams
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Introduction to major issues relating to American Indian education including pupil-teacher relationships, teacher-community relationships, curriculum, and school organization.

***111. Native American Curriculum Development** (4) III. Rising
Lecture—2 hours; seminar—2 hours. Prerequisite: course 110 or consent of instructor. The study and evaluation of existing Native American curricula and the design and preparation of new curricula and materials. Offered in even-numbered years.

112. History and Culture of the "Five Civilized Tribes" (4) I, Hutchison
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 recommended. History and culture of the Native American people, found in southeastern part of the U.S., called the "Five Civilized Tribes."

***113. Navajo History and Culture** (4) III.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Introduction to the history and life-way of the DINEH (Navajo) people and taught from the Navajo perspective. Attention will be given to both ancient and modern time periods.

116. Native American Traditional Governments (4) II. Rising
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Intensive study of selected Native American Tribal Governments, confederations, leagues, and alliance systems.

***124. Contemporary Affairs of Native Americans in California** (4) III. Rising
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Intensive survey of the contemporary problems, issues, and developments involving Native Americans, both urban and rural, in California.

130A. Native American Ethno-Historical Development (4) I, Forbes
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Intensive survey of Native American Ethno-History in the United States, Canada, Greenland, and Northern Mexico in the years before 1770. Offered in even-numbered years.

130B. Native American Ethno-Historical Development (4) II. Forbes
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Intensive survey of Native American Ethno-History in the United States, Canada, Greenland, and Northern Mexico in the years 1770-1890. Offered in odd-numbered years.

***130C. Native American Ethno-Historical Development** (4) III. Forbes
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Intensive survey of Native American Ethno-History in the United States, Canada, Greenland, and Northern Mexico in the years after 1890. Offered in odd-numbered years.

140. Research Analysis in Native American Studies (4) I, Adams
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1, 20. Research methods and techniques of analysis and synthesis pertinent to the social-behavioral science aspects of Native American Studies. Will concentrate upon one sub-area for special emphasis. Offered in even-numbered years.

***155. Americanisms: Native American Contributions to World Civilization** (4) I, Hutchison
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing or consent of instructor. Analysis and study of Americanisms: traits, inventions, and developments originated in the Americas by native peoples and adopted by other peoples. Attention will be given to words in the world's languages, agriculture, medicine, clothing, the arts, theories of society and government, and other pertinent areas. Offered in odd-numbered years.

***156. Native American Ethics and Value Systems** (4) I. The Staff (Hutchison in charge)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20, or consent of instructor. 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 odd-numbered years.

157. Native American Religion and Philosophy (4) III. Forbes
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Religious and philosophical thinking of Native American people with emphasis upon North America. Offered in odd-numbered years.

***161A. Native American Community Development** (4) II. Adams
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 and 20 or consent of instructor. An intensive application of community development theory and techniques to the development problems of American Indian reservations and communities under the control of one or more governing bodies.

161B. Native American Economic Development and Planning (4) I, Adams
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 and/or 20, 161A, Anthropology 108. Planning in economic development from the reservation standpoint, concentrating on using those institutions located on Indian reservations.

170. Native American Perception (4) II. Hutchison
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 recommended. Study of the differences in perception between Native Americans and the dominant society.

***171. Counseling the Native American** (4) III. Hutchison
Lecture—3 hours; discussion—1 hour. Theory and practice of counseling to reveal the subjective, cultural and interfering differences between Native Americans and the dominant culture.

180. Native American Woman (4) III. Hutchison
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 recommended. Foundations of the feminine personality including the psychological development of the Indian girl, life phases of mature womanhood and the individual feminine ego experience.

181A-181B-181C. Native American Literature (4-4-4) I-II-III. Hutchison
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20. 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) Non-fiction works by Native authors; C) Traditional literature and poetry. Offered in even-numbered years.

190. Seminar in Native American Studies (2) III. The Staff (Rising in charge)
Discussion—2 hours. Prerequisite: senior standing. Seminar of critical issues faced by Native American people. (P/NP grading only.)

195. Field Experience in Native American Studies (12) I, II, III. Rising in charge
Prerequisite: major in Native American Studies and consent of instructor; courses 161A-161B and Applied Behavioral Sciences 151-152 recommended. Internship with governmental, community and grassroots groups, application of knowledge learned in other courses.

196. Senior Project in Native American Studies (1-5) I, II, III. Rising in charge
Prerequisite: major in Native American Studies and consent of adviser. Guided research or creative activity leading to completion of senior thesis or project. May be repeated for credit, for a maximum of 10 units. (P/NP grading only.)

197T. Tutoring in Native American Studies (1-5) I, II, III. The Staff (Rising in charge)
Prerequisite: consent of major committee; upper division standing with major in Native American Studies. Leading of small voluntary discussion groups. (P/NP grading only.)

197TC. Community Tutoring in Native American Studies (1-5) I, II, III. The Staff (Rising in charge)
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 (Rising 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 (Rising in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Nematology

(College of Agricultural and Environmental Sciences)

David R. Viglierchio, Ph.D., Chairperson of the Division

Division Office, 488 Hutchison Hall (752-1403)

Faculty

Harry K. Kaya, Ph.D., Associate Professor
Benjamin F. Lownsbey, Ph.D., Professor
Armand R. Maggenti, Ph.D., Lecturer
Dewey J. Raski, Ph.D., Professor
David R. Viglierchio, Ph.D., Lecturer

Related Major Program. See the major in Entomology (page 200).

Graduate Study. Graduate degrees specializing in Nematology are offered through the Department of Entomology or the Department of Plant Pathology.

Courses in Nematology

100. General Plant Nematology (4) I, Lownsbey
Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1 or 10; lower division students with consent of instructor only. An introduction to the classification, morphology, biology, and control of the nematodes attacking cultivated crops.

110. Introduction to Nematology (2) II. Maggenti
Lecture—2 hours. Prerequisite: Zoology 2 or the equivalent or consent of instructor. The relationship of nematodes to

Nutrition

man's environment. Classification, morphology, ecology, distribution, and importance of nematodes occurring in water and soil as parasites of plants and animals.

130. Principles of Nematode Control (4) III. Lear (Plant Pathology)

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100; Chemistry 8B and Statistics 13 recommended. Principles and techniques used for derivation of data and their interpretation as the basis for control of plant parasitic nematodes. The biological, physical, and chemical factors influencing nematodes and their control are studied in laboratory and greenhouse. Some field trips required.

Graduate Courses

*220. Principles and Techniques of Nematode Taxonomy and Morphology (4) III. Raski

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 odd-numbered years.

*222. Nematode Pathogenicity to Plants (3) II. Lownsbery

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 100. Investigations of problems in proving nematode pathogenicity; the role of nematodes in plant diseases. Offered in odd-numbered years.

*225. Nematode Taxonomy and Comparative Morphology (5) II. Maggenti

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 even-numbered years.

290. Seminar (1) II. The Staff (Chairperson in charge) Seminar—1 hour. Selected aspects of general nematology. Topics vary from year to year.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge) Selected topics in Nematology. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Louis E. Grivetti, Ph.D., Assistant Professor
(*Nutrition, Geography*)

Frederic W. Hill, Ph.D., Professor

Lucille S. Hurley, Ph.D., Professor

Jess F. Kraus, Ph.D., Associate Professor

(*Nutrition, Medicine*)

Jo Ann Prophet, M.S., Lecturer

Robert B. Rucker, Ph.D., Professor

Barbara O. Schneeman, Ph.D., Assistant

Professor (*Nutrition, Food Science and Technology*)

Judith S. Stern, Sc.D., Associate Professor

Helene Swenerton, Ph.D., Lecturer

Aloys L. Tappel, Ph.D., Professor (*Nutrition, Food Science and Technology*)

William C. Weir, Ph.D., Professor

Frances J. Zeman, Ph.D., Professor

Related Major Program. See the major in Nutrition Science, page 263.

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

Lower Division Courses

10. Discoveries and Concepts in Nutrition (3) II, III. Weir 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.

20. Food and Culture: An Introduction to Culture, Diet, and Cuisine (4) III. Grivetti

Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 2, Geography 2, and Nutrition 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. (Same course as Food Science and Technology 20.)

93. Public Issues in Nutrition and Food Science (1) II. Weir, Schweigert (Food Science and Technology)

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 (Weir in charge)

Prerequisite: consent of instructor. To provide opportunity for students to undertake individual projects in library study, laboratory study, field study, and information analysis in nutrition. (P/NP grading only.)

Upper Division Courses

101. An Introduction to Nutrition and Metabolism (5) I.

Lecture—5 hours. Prerequisite: Chemistry 8B; Physiology 110 or 2. An 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.

102. Nutrition in the Life Cycle (3) II.

Lecture—3 hours. Prerequisite: course 101 or a course in either biochemistry or physiological chemistry. A practical approach to the problems of meeting the nutritional needs of healthy people throughout the life cycle. Not open for credit to students who have taken courses 110 or 111.

103. Animal Nutrition and Feeding (4) I, Garrett (Animal Science)

Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 8B. The basic principles of animal nutrition as they are applied to livestock feeding; the composition and uses of feedstuffs in their relation to the feeding of farm animals and poultry; the balancing of rations.

110. Principles of Nutrition (5) II, III. Calvert (Animal Science)

Lecture—5 hours. Prerequisite: Biochemistry 101B; a course in physiology or zoology. Fundamental principles of the nutrition of man and other animals. The nutrients in relation to physiological processes of growth, maintenance, and reproduction. Nutritional disorders.

111. Human Nutrition (4) III. Stern

Lecture—4 hours. Prerequisite: course 110. Nutrition of man; critical study of nutrient requirements at various phases of the life cycle.

111L. Nutrition Laboratory (1) II, III. Ferrell, Stern

Laboratory—3 hours. Prerequisite: course 110 or 101. Laboratory study of the chemical and physiological roles of nutrients in metabolism; use of experimental animals in determining the essentiality and function of nutrients.

112. Nutritional Considerations of Food Processing (3) III. Schneeman

Lecture—3 hours. Prerequisite: Biochemistry 101A-101B or understanding of the biochemical function of nutrients. The metabolism and availability of nutrients from foods. The effect of food processing techniques on the retention of nutrients in foods. Students having had course 102 or 110 may receive only 2 units of credit for this course.

114. Nutrition and Development (4) II. Hurley

Lecture—4 hours. Prerequisite: course 110 or 102. Role of nutritional factors in embryonic and postnatal development.

116A-116B. Diet Therapy (3-3) I-II. —, Clifford, Stern

Lecture—3 hours. Prerequisite: course 111 or 102; 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. Zeman

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.

Lecture—½ hour; laboratory—1½ hours; extensive written assignments. Prerequisite: course 116B (may be taken concurrently); 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 or 102; Biochemistry 101B or Physiological Sciences 101B; 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 (3) II.

Lecture—3 hours. Prerequisite: course 102 or 111. Examination of nutrition problems in contemporary communities. Consideration of social, political, and economic forces in development and implementation of community nutrition programs. Principles and methods of nutrition education. Evaluation of community nutrition programs and resources.

119. Field Work in Community Nutrition (4) II, III. Grivetti.

Lecture—2 hours; six hours field work per week. Prerequisite: course 118 (may be taken concurrently) or consent of instructor. Introduction to field work in community nutrition; development of basic skills in assessing nutritional problems; application of basic skills to community nutrition programs serving selected sub-groups, especially young children, adolescents, adults, the elderly, and minorities.

120. Food Habits and their Nutritional Implications (4) III. Grivetti

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division or graduate standing; upper division course in nutrition or Biochemistry 101B; 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.

121. Technical Animal Nutrition (2) II. Heitman and Bath (Animal Science)

Lecture—2 hours. Prerequisite: course 110. The application of the principles of nutrition to the feeding of livestock. Evaluation of the nutrient content and feeding value of feedstuffs and formulated rations. Feeding standards and nutrient requirements for physiological functions. Ration formulation; least cost rations.

122. Ruminant Nutrition and Digestive Physiology (3) III. Morris (Animal Science)

Lecture—3 hours. Prerequisite: Physiology 110; Biochemistry 101A-101B or Physiological Sciences 101A-101B; Bacteriology 2 recommended. Study of nutrient utilization as influenced by the unique aspects of digestion and fermentation in the ruminant.

Neurology

See Medicine

Neurosurgery

See Medicine

Nutrition

(College of Agricultural and Environmental Sciences)

William C. Weir, Ph.D., Chairperson of the Department

Department Office, 129 Everson Hall (752-6650)

Faculty

Nemat O. Borhani, M.D., Professor (*Nutrition, Medicine*)

Andrew J. Clifford, Ph.D., Professor

Madeline F. Ferrell, Ph.D., Assistant Professor

122L. Ruminant Nutrition Laboratory (2) III. Macy and Moris (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. Nutrition of Non-Ruminant Animals (3) III. Kratzer (Avian Sciences), Calvert (Animal Science)
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 103 or course 110. Application of nutrition principles to the feeding of non-ruminant species, including swine, poultry and laboratory animals.

129. Journalistic Practicum in Nutrition (2) II. Stern
Discussion—2 hours. Prerequisite: Nutrition 111 or Nutrition 102 and Nutrition 116A; course in written or oral expression. 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.

190. Proseminar in Nutrition (1) I, II, III. The Staff (Weir in charge)
Seminar—1 hour. Prerequisite: senior standing; course 102 or 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.)

192. Internship (1-12) I, II, III. The Staff (Weir in charge)
Laboratory—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 (Weir in charge)
Discussion-laboratory—3 or 6 hours. Prerequisite: Nutrition, Dietetics, Community Nutrition or related major. Completion of course 101 or 110 with B grade 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 (Weir in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Weir in charge)
(P/NP grading only.)

Graduate Courses

201. Advanced Vitamin and Mineral Nutrition (4) I, Rucker
Lecture—4 hours. Prerequisite: course 110, Bacteriology 2, Biochemistry/Physiological Sciences 101B, Physiology 110. Advanced studies of metabolic function and nutritional interrelationships of vitamins and minerals. Comparative aspects.

202. Advanced Animal Energetics and Energy Metabolism (4) II. The Staff (Baldwin, Animal Science, in charge)
Lecture—4 hours. Prerequisite: course 110, Biochemistry/Physiological Sciences 101B, Physiology 110. 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; appetite regulation; obesity, lipid transport and metabolism.

203. Advanced Protein and Amino Acid Nutrition (4) III. The Staff (Rogers, Physiological Sciences, in charge)
Lecture—4 hours. Prerequisite: course 110, Bacteriology 2, Biochemistry/Physiological Sciences 101B, Physiology 110. 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.

***212. Design and Evaluation of Nutrition Education Programs** (2) III.

Lecture—2 hours. Prerequisite: graduate standing in nutrition. Skills and techniques of planning and evaluating nutrition programs. Emphasis on nutrition education; curricula, instructional strategies and evaluation methods in formal classroom and informal community settings. Intended for students preparing to administer programs or teach in universities or dietetic internships.

216. Advanced Diet Therapy (3) III. Zeman
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, IV.
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.

***251. Single Carbon Metabolism in Nutrition** (2) I, Kratzer and Vohra (Avian Sciences)
Lecture—2 hours. Prerequisite: course 203. Nutritional and metabolic interrelationships involved in the transfer of single carbon units in various animals; the involvement of the metabolic function of biotin, folic acid, vitamin B12 pyridoxine, choline, methionine and other nutrients. Offered in odd-numbered years.

***252. Nutrition and Development** (3) II. Hurley
Lecture—3 hours. Prerequisite: courses 201, 202, 203. Relationship of nutrition to prenatal and early postnatal development. Offered in even-numbered years.

***253. Control of Food Intake** (3) III. Rogers (Physiological Sciences), Mendel (Animal Science), Stern
Lecture—2 hours; discussion—1 hour; 2 or 3 laboratory demonstrations per quarter. Prerequisite: courses 201, 202 or Physiology 210B 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 even-numbered years.

254. Ruminant Digestion and Metabolism (3) I, Morris and Baldwin (Animal Science)
Lecture—3 hours. Prerequisite: courses 122, 201, 202, 203 recommended. Qualitative and quantitative aspects of ruminant digestive and metabolic processes; nutrient requirements; rumen microbiology and biochemistry; digestive physiology; nutrient absorption; patterns, rates and mechanisms of nutrient utilization; regulatory processes. Offered in even-numbered years.

255. Natural Toxicants in Foods (2) II. Vohra and Kratzer (Avian Sciences)
Lecture—2 hours. Prerequisite: courses 201, 202, 203. Occurrence, mode of action and alleviation of several natural toxicants in foods and feeds. Offered in odd-numbered years.

***256. Nutritional and Hormonal Control of Animal Metabolic Function** (3) III. Baldwin (Animal Science), Freedland (Physiological Sciences)
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 odd-numbered years.

280. Supervised Teaching in Dietetics (2-12) I, II, III. extra-session summer. Hopkins
Laboratory—3 hours per unit. Prerequisite: graduate standing in M.S. program in Nutrition with emphasis in dietetics; consent of instructor. Directed teaching in approved dietetic internships. May be repeated for a total of 12 units.

290. Beginning Nutrition Seminar (1) I, II, III. The Staff (—) in charge.
Discussion—1 hour; seminar—1 hour. Prerequisite: first-year graduate standing. Discussion and critical evaluation of topics in nutrition with emphasis on literature review and evaluation in this field. Limited enrollment.

291. Advanced Nutrition Seminar (1) I, II, III. Heitman (Animal Science) in charge
Seminar—1 hour. Prerequisite: second-year graduate standing. Discussion and critical evaluation of advanced topics in nutrition research. (S/U grading only.)

297. Supervised Teaching in Nutrition (2) I, II, III. Weir
Teaching under supervision of members of Nutrition Graduate Group—6 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, and an evaluation letter to the Graduate Adviser with copy to the student.)

298. Group Study (1-5) I, II, III. The Staff (Weir in charge)

299. Research (1-12) I, II, III. The Staff (Weir in charge)
(S/U grading only.)

Nutrition Science

(College of Agricultural and Environmental Sciences)

The Major Program

The Nutrition Science major provides organized study in nutrition and relevant biological and physical sciences as preparation for (1) graduate study in nutrition, including the nutrition of species or groups, such as human, domestic animal, avian and wildlife; (2) professional study of medicine, veterinary medicine, public health, dietetics†, and other health sciences; (3) technical work in nutrition in animal, food, and pharmaceutical industries; (4) technical writing; and (5) health education. You should consult with your adviser with respect to additional courses appropriate to your specific interest.

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
Preparatory Subject Matter	52
Biochemistry (Biochemistry 101A, 101B or Physiological Sciences 101A, 101B)	6
Biology with laboratory (Biological Sciences 1)	5
Chemistry, general and organic (Chemistry 1A, 1B, 1C, 5, 8A, 8B)	25
Microbiology with laboratory (Bacteriology 2, 3)	4
Statistics (Statistics 13 or Agricultural Science and Management 150)	4
Written or oral expression (see College requirement)	8
Depth Subject Matter	20
Select from Nutrition 110, 111, 111L, 114, 116A, 116B, 117, 121, 122, 123, 190, 198, and 199.	
Breadth Subject Matter	20
Courses in social sciences and humanities.	
Restricted Electives	46
Biochemistry laboratory (Biochemistry 101L, 123, 123L)	5
Calculus or physics (excluding Physics 10)	6
Foods and food science	6
Physiology with laboratory (Physiology 110, 110L, plus an additional physiology course)	10
Additional nutrition or related biological and physical sciences	19-21
Unrestricted Electives	42
Total Units for the Major	180

Major Adviser. W. C. Weir (Nutrition).

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 page 99.

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, Psychology 1, Sociology or Anthropology 2, Economics 1B, Food Science and Technology 100A, 100B, Nutrition 110, 111, 111L, 116A, 116B. The following courses must be added: Agricultural Economics 112; Food Science and Technology 101A, 101B; 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 must contact the Master Adviser in Dietetics no later than the first quarter of the junior year for information on procedures.

Oriental Languages and Civilizations

(College of Letters and Science)

Department Office (Anthropology), 328 Young Hall (752-0745)

Faculty

Donald Gibbs, Ph.D., Associate Professor
Key H. Kim, Ph.D., Associate Professor
Janet Shibamoto, Ph.D., Assistant Professor
Benjamin E. Wallacker, Ph.D., Professor
Yun-Chen Li, M.A., Lecturer

Related Courses. See East Asian Studies course listing.

Minor Program. Available through consultation with an undergraduate adviser in Oriental Languages and Civilizations.

Courses in Chinese

(See *Asian American Studies* for courses in *Cantonese Language*.)

Lower Division Courses

1-2-3. Elementary Modern Chinese (6-6-6) I-II-III. Li
Lecture—3 hours; recitation—3 hours. (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.)

4-5-6. Intermediate Modern Chinese (6-6-6) I-II-III. Gibbs
Lecture—3 hours; recitation—3 hours. Prerequisite: course 3 or the equivalent.

Upper Division Courses

101. Classical Chinese (4) I, II, III. Wallacker
Lecture—3 hours; term paper. Prerequisite: course 6. Readings in selected texts. May be repeated twice for credit. To be given if a sufficient number of students enroll.

111. Modern Chinese Literature: Reading and Discussion (4) I, II, III. Gibbs
Lecture—3 hours; discussion—1 hour. Prerequisite: course 6 or the equivalent. Short stories, newspaper articles, essays. May be repeated twice for credit.

Courses in Japanese

Lower Division Courses

1-2-3. Elementary Modern Japanese (6-6-6) I-II-III. Shibamoto
Lecture—3 hours; recitation—3 hours. (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.)

4-5-6. Intermediate Modern Japanese (6-6-6) I-II-III. Kim
Lecture—3 hours; recitation—3 hours. Prerequisite: course 3 or the equivalent.

Upper Division Courses

101. Literary-Style Japanese (2) I, II, III. Kim
Lecture—1½ hours; term paper. Prerequisite: course 121. Readings from selected pre-World War II Japanese texts in the *bungobun* style. May be repeated for credit.

121. Modern Japanese: Reading and Discussion (4) I, II, III. Kim, Shibamoto
Lecture—3 hours; discussion—1 hour. Prerequisite: course 6. Short stories, newspaper articles, essays. May be repeated twice for credit.

Courses in Oriental Languages and Civilizations

Lower Division Courses

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

100. Languages of Eastern Asia (4) II. Wallacker
Lecture—3 hours; oral reports. Prerequisite: Anthropology 110 (may be taken concurrently) or the equivalent. Survey of languages and language families of Eastern Asia, their natures and distributions.

197T. Tutoring in Oriental Languages (1-5) I, II, III. The Staff (Wallacker in charge)
Tutorial—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. (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

***201. Proseminar in Sinological Methods** (4) III. Wallacker
Seminar—3 hours. Prerequisite: knowledge of classical Chinese.

299. Research (1-12) I, II, III. The Staff (S/U grading only.)

Orientation

(College of Agricultural and Environmental Sciences)

Course in Orientation

Questions pertaining to the following course should be directed to the instructor or to the Academic Advising Center, 122 Hoagland 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

Otorhinolaryngology

See Medicine

Pathology

Veterinary Medicine, this page; Medicine, see page 253

Pathology

(School of Veterinary Medicine)

Donald L. Dungworth, B.V.Sc., Ph.D.,
Chairperson of the Department

Department Office, 1126 Haring Hall (752-1385)

Faculty

Donald R. Cordy, D.V.M., Ph.D., Professor
Donald L. Dungworth, B.V.Sc., Ph.D., Professor
David H. Gribble, D.V.M., Ph.D., Associate Professor
Thomas G. Kawakami, Ph.D., Associate Adjunct Professor
Peter C. Kennedy, D.V.M., Ph.D., Professor
Peter F. Moore, B.V.Sc., Ph.D., Assistant Professor
Jack E. Moulton, D.V.M., Ph.D., Professor
Bennie I. Osburn, D.V.M., Ph.D., Professor
Roy R. Pool, Jr., D.V.M., Ph.D., Professor
Lester W. Schwartz, D.V.M., Ph.D., Associate Professor
Anthony A. Stannard, D.V.M., Ph.D., Associate Professor (*Pathology, Medicine*)
Eric B. Wheelodon, B.V.M.S., Ph.D., Assistant Professor

Courses in Pathology

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

282. Tumor Pathology (3) II. Moulton, Dungworth
Lecture—3 hours. Prerequisite: graduate student 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 even-numbered years.

286A. Selected Topics in Advanced Special Pathology (3) I. The Staff (Dungworth in charge)
Lecture—3 hours. Prerequisite: graduate standing or final year veterinary medical student; consent of instructor. Patterns of reaction to injury of selected organ systems and differentiating morphologic characteristics of their major disease entities. Emphasis will be on pathogenetic mechanisms and cellular/subcellular pathology involved in inflammation, pulmonary disease, renal disease, and avian disease. Offered in even-numbered years.

286B. Selected Topics in Advanced Special Pathology (3) II. The Staff (Dungworth in charge)
Lecture—3 hours. Prerequisite: graduate standing or final year veterinary medical student; consent of instructor. Patterns of reaction to injury of selected organ systems and

differentiating morphologic characteristics of their major disease entities. Emphasis will be on pathogenetic mechanisms and cellular/subcellular pathology of the musculoskeletal, ophthalmic and gastrointestinal systems and immunopathology. Offered in odd-numbered years.

286C. Selected Topics in Advanced Special Pathology (3) III. The Staff (Dungworth in charge)

Lecture—3 hours. Prerequisite: graduate standing or final-year veterinary medical student; consent of instructor. Patterns of reaction to injury of selected organ systems and differentiating morphologic characteristics of their major disease entities. Emphasis will be on pathogenetic mechanisms and cellular/subcellular pathology of the skin, nervous system, and reproductive system. Offered in odd-numbered years.

290. Seminar in Veterinary Pathology (1) I, II, III. The Staff (Schwartz in charge)

Seminar—1 hour. (S/U grading only.)

291. Histopathology Conference (1) I, II, III. The Staff (Kennedy in charge)

Discussion—1 hour. Prerequisite: graduate student 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.)

292. Surgical Pathology Conference (1) I, II, III. Moulton, Gribble

Discussion—1 hour. Prerequisite: graduate student 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.)

293. Necropsy and Surgical Pathology (1-4) I, II, III. The Staff (Kennedy in charge)

Discussion—1 hour; laboratory—32 hours. Prerequisite: graduate student standing; consent of instructor. Responsible diagnostic casework. Performance of necropsies, slide reading, and case reporting. (S/U grading only.)

294. Primate Pathology Conference (1) I, II, III. Schwartz

Discussion—1 hour. Prerequisite: graduate student standing or final-year veterinary student; consent of instructor. Discussion of selected topics in primate pathology based on currently available material. Given jointly by Departments of Pathology in the Medical and Veterinary Schools, and the California Primate Research Center. (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 in Veterinary Pathology (1-12) I, II, III. The Staff

(S/U grading only.)

Pharmacology and Toxicology (A Graduate Group)

Theodore C. West, Ph.D., Chairperson of the Group
Group Office, 4443 Medical Science 1A
(Department of Pharmacology), (752-3200)

Faculty

Graduate group faculty members are based in the Departments of Environmental Toxicology, Pharmacology, Physiological Sciences and other related departments and laboratories in Medicine, Veterinary Medicine and Agricultural and Environmental Sciences.

Graduate Study. The Graduate Group in Pharmacology and Toxicology offers programs of study and research leading to the M.S. and Ph.D. degrees. For information on the program of study, contact the appropriate graduate adviser (below) or the group Chairperson. See also page 99.

Graduate Advisers. D.P.H. Hsieh (Environmental Toxicology), R.M. Joy (Physiological Sciences), T.C. West (Pharmacology).

Courses in Pharmacology and Toxicology

Graduate Courses

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: Pharmacology 200A-200B, Environmental Toxicology 200, or 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
Prerequisite: consent of instructor. Current topics in pharmacology and toxicology. (S/U grading only.)

free choice possible? Can we justify our claims to know anything? Are there objective criteria for distinguishing rational from irrational beliefs? Is there a God? Is morality merely a matter of each individual's feelings, or are there objective principles for deciding what is right or wrong? Thus, the problems studied are of interest to people, regardless of their field.

A second common reason is that being forced to think carefully and precisely about philosophical arguments concerning fundamental issues can be excellent training for the intellectual rigors of any academic subject. Students rightly look on course work in philosophy as helping in the development of intellectual discipline.

A third reason is that the sorts of issues philosophers raise have relevance for most fields. Virtually every University subject, from History to Computer Science, poses philosophical problems when fundamental concepts or methods are discussed. The study of philosophy, then, has relevance through the range of University disciplines.

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 history, philosophy of mathematics, political philosophy, philosophy of religion, and philosophy of the natural and social sciences.

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 all the major figures and traditions of western philosophy, as well as in the influential contemporary schools of the continental and analytic varieties.

Many students become sufficiently interested to major in philosophy, either 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 have even been known to go into such fields as architecture and art history.

Philosophy

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 the approval of the departmental major adviser	36
Total Units for the Major	52

Major Advisers. R.A. Arbini, F.R. Berger.

Minor Program Requirements:

In consultation with the minor adviser, students may plan a minor in Philosophy. Students may select a broad range of courses, or they may concentrate their work in a special field. Examples of specialized areas of study include philosophy and the sciences, philosophy and society, history of philosophy, and logic and language.

	UNITS
Philosophy	20
At least sixteen upper division units in philosophy, chosen in consultation with minor adviser	16-20

Minor Adviser. G.J. Matthey.

Pediatrics

See Medicine

Philosophy

(College of Letters and Science)
William H. Bossart, Ph.D., Chairperson of the Department
Department Office, 308 Voorhies Hall (752-0607)

Faculty

Ronald A. Arbini, Ph.D., Associate Professor
*Fred R. Berger, Ph.D., Professor
William H. Bossart, Ph.D., Professor
Arthur Child, Ph.D., Professor Emeritus
*Joel I. Friedman, Ph.D., Professor
Neal W. Gilbert, Ph.D., Professor
Marjorie Grene, Ph.D., Professor Emeritus
John F. Malcolm, Ph.D., Professor
George J. Matthey II, Ph.D., Assistant Professor
Michael V. Wedin, Ph.D., Associate Professor

The Major Program

There are almost as many reasons for studying philosophy as there are students. The most common reason, however, is that philosophy examines the kinds of questions that puzzle all thinking people at some time or another in their lives: Is everything material? Is human behavior determined, or is

Pharmacology

See Medicine

NOTE: For key to footnote symbols, see page 130

Philosophy

Courses for Non-Majors. The department offers a range of courses for non-majors. Students pursuing careers in agriculture and engineering might find Philosophy 5 and 10A-G especially useful, since these courses provide practice in concise and logical writing. Science and mathematics students may find these courses useful, as well as Philosophy 12, 21, 22 and 23. Pre-law students and students planning careers in medicine or the various health sciences may be interested in Philosophy 14 and 114A-114B. The offerings at the upper division level include courses of direct relevance to students in the biological and physical sciences, in psychology, history, art, sociology, anthropology, and political science.

Department Activities for Undergraduates. The Philosophy Department sponsors a series of well-known philosophers who present papers in their fields of expertise. The department also operates on-going faculty and graduate student colloquia. Undergraduate students are welcome to attend and join these discussions. Information can be obtained in the department office.

Through a grant from University President David Saxon, the department sponsors an essay contest each year which is open to all undergraduates. The Saxon Prize in Philosophy consists of a monetary award to the student submitting the best essay on the subject set for the year. 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. Graduate students who intend to work *only* for the M.A. degree are not admitted to the graduate program. Detailed information may be obtained by writing to the Graduate Adviser.

Graduate Adviser. M.V. Wedin.

Courses in Philosophy

Lower Division Courses

1. Introduction to Philosophy (4) I, II, III. The Staff (Chairperson in charge)
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.

5. Critical Reasoning (4) III. Mathey
Lecture-discussion—3 hours; papers or written reports. 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.

10A-G. Themes in Philosophy (4) I, II, III. The Staff
Lecture-discussion—3 hours; papers or written reports. Introductory study of related problems in an area of philosophical interest. Sections to be offered: (A) Knowledge and Existence; (B) Self and Mind; (C) Philosophy and the Arts; (D) Morals and Politics; (E) Philosophy East and West; (F) Philosophy and Myth; (G) Science and Human Nature.

12. Introduction to Logic (4) I, Friedman
Lecture—3 hours; discussion—1 hour. Basic concepts and techniques of deductive logic with emphasis on propositional logic. Development of a deductive system for propositional logic. Translation of English into symbolic formulas.

14. Ethical and Social Problems in Contemporary Society (4) I, Gilbert
Lecture—3 hours; discussion—1 hour. 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.

21. History of Philosophy: Ancient (4) I, Malcolm
Lecture—3 hours; discussion—1 hour. A survey of Greek philosophy with special attention to the Pre-Socratics, Plato and Aristotle.

22. History of Philosophy: Seventeenth Century (4) II. Bossart
Lecture—3 hours; discussion—1 hour. Selections from Descartes, Spinoza, Leibniz and Hobbes.

23. History of Philosophy: Eighteenth Century (4) III. Mathey
Lecture—3 hours; discussion—1 hour. Selections from Locke, Berkeley, Hume, and Kant.

Upper Division Courses

100. Founders of Modern Thought (4) III. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: not open to philosophy majors or students who have received credit for course 22 or 23. A survey of modern philosophy from Descartes to Kant. Major emphasis upon problems still current today.

101. Metaphysics (4) III. Malcolm
Lecture-discussion—3 hours; term paper. 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.

102. Theory of Knowledge (4) II. Mathey
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy recommended. Philosophical problems of perception and thought, memory and precognition, imagination, truth and error, belief and knowledge. Types of epistemology.

***103. Philosophy of Mind** (4) II. Wedin
Lecture-discussion—3 hours. 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. Offered in even-numbered years.

105. Philosophy of Religion (4) I, Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy recommended. Logical, metaphysical, epistemological and existential aspects of selected religious concepts and problems.

107. Philosophy of the Physical Sciences (4) I, Friedman
Lecture-discussion—3 hours; term paper. Prerequisite: one philosophy course or a science background recommended. The nature of testability and confirmation of scientific hypotheses; the nature of scientific laws, theories, explanations, and models. Problems of causality, determinism, induction, and probability; the structure of scientific revolutions.

108. Philosophy of the Biological Sciences (4) III. Ayala
Lecture-discussion—4 hours. Prerequisite: a background in a biological science or one philosophy course recommended. Scientific method in biology. Nature of biological theories, explanations, and models. Problems of evolutionary theory, ecology, and sociobiology. Bio-engineering and environmental ethics. (Same course as Genetics 108 and Environmental Studies 108).

***109. Philosophy of the Social Sciences** (4) II. Berger
Lecture-discussion—3 hours; term paper. Prerequisite: one philosophy course or social science background recommended. The nature of human action and behavior, and of explanation of behavior. Nature of laws and explanation in the social sciences. Problems in the social sciences such as: "Interpretive understanding," role of prediction, behaviorism, reductionism, role of value judgements, and social rules.

112. Intermediate Logic (4) II. Friedman
Lecture—3 hours; discussion—1 hour. Prerequisite: course 12 or consent of instructor. Development of the full quantifier logic, with identity and descriptions; decision procedures; advanced translation of English into the formal language; elementary theory of classes and relations; Russell's paradox.

114A. Introduction to Ethics (4) II. Arbins
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy recommended. An introduction to major writings of philosophers on central problems of right conduct; principles of obligation, responsibility, justice, the meaning of the basic terms of ethical language. Readings from such philosophers as Aristotle, Butler, Hume, Kant, Mill.

***114B. Problems of Ethical Theory and Practice** (4) II. Berger
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy recommended. Discussion of important problems of ethical theory with application to contemporary moral problems. Examples: relativism, utility and justice, act and rule utilitarianism, concept of a right, justification of punishment, the death penalty, morality of civil disobedience, abortion, war.

117. Political Philosophy (4) II. Berger
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy recommended. Intensive examination of some central concepts of political thought such as the state, sovereignty, rights, obligation, freedom, law, authority, and responsibility. Offered in even-numbered years.

118. Philosophy of History (4) III. Child.
Lecture-discussion—3 hours; term paper. Survey of philosophical theories of history and an analysis of contemporary problems of historical explanation. Offered in even-numbered years.

***123. Aesthetics** (4) II. Child
Lecture-discussion—3 hours. 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.

131. Philosophy of Logic and Mathematics (4) III. Friedman
Lecture-discussion—3 hours; term paper. Prerequisite: course 12 or one course for credit in mathematics. The nature of formal systems and mathematical theories. Selected topics from: logical and semantical paradoxes; foundations of mathematics; set theory, type theory, and intuitionistic theory; philosophy of geometry; philosophical implications of Godel's incompleteness results. Offered in even-numbered years.

132. History of Logic (4) II. Malcolm
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy or logic recommended. Overview of the chief developments in the history of logic. Offered in even-numbered years.

133. Survey of Advanced Logic (4) III. Friedman
Lecture-discussion—3 hours; written reports. Prerequisite: course 112 or consent of instructor. Survey of topics in mathematical logic. Theory of descriptions (Russell and Frege); classes and relations; Russell's Paradox; type theory, set theory; models and interpretations; modal logic. Selected from: computability and recursion theory, many-valued logic, combinatory logic, non-standard logics. Offered in even-numbered years.

137. Philosophy of Language (4) III. Arbins
Lecture-discussion—3 hours; term paper. Prerequisite: one course in Philosophy or linguistics. Discussion of problems arising from consideration of the syntax and semantics of natural and formalized languages. Nature of linguistic rules and universals; theories of universal grammar; linguistic implications for theories of cognition.

143. Hellenistic Philosophy (4) III. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: course 21. Offered in odd-numbered years.

***145. Medieval Philosophy** (4) III. Gilbert
Lecture-discussion—3 hours; written reports. Prerequisite: course 21. Study of major philosophers in the medieval period.

146. Renaissance Philosophy (4) I, Gilbert
Lecture-discussion—3 hours. Renaissance conceptions of man, as found in the writings of Valla, Ficino, Pico, Pomponazzi, Erasmus, Vives, and Montaigne. Some reference to current religious and social developments. Offered in odd-numbered years.

151. Philosophy of the Nineteenth Century (4) II. Mathey
Lecture-discussion—3 hours. Prerequisite: courses 21, 22, or 23 recommended. The idealism of Hegel, his contemporaries and his successors: Marxism; the positivism of Comte and Mill; the irrationalism of Kierkegaard and Nietzsche. Offered in odd-numbered years.

155. American Philosophy (4) III. Mathey
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. Offered in even-numbered years.

156. Contemporary British Philosophy (4) III. Wedin
Lecture-discussion—3 hours; term paper. Prerequisite: one course in Philosophy; especially course 23 recommended. Interpretation and analysis of the most influential works of Bertrand Russell, G.E. Moore, Wittgenstein, J.L. Austin, and G. Ryle. Offered in odd-numbered years.

158. Phenomenology (4) I, Bossart
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy; course 23 especially recommended. Husserl, his predecessors and successors. Offered in even-numbered years.

159. Existentialism (4) III. Mathey
Lecture-discussion—3 hours; term paper. Prerequisite: one course in Philosophy; course 23 especially recommended. Such twentieth-century thinkers as Jaspers, Marcel, Sartre, Merleau-Ponty. Offered in even-numbered years.

161. Plato (4) I, Malcolm
Lecture-discussion—3 hours. Prerequisite: course 21. Offered in even-numbered years.

162. Aristotle (4) II. Wedin
Lecture-discussion—3 hours. Prerequisite: course 21 or consent of instructor. Offered in odd-numbered years.

168. Descartes (4) III. Arbini
Lecture-discussion—3 hours; term paper. Prerequisite: course 22. Offered in even-numbered years.

169. Spinoza (4) II. Friedman
Lecture-discussion—3 hours; term paper. Prerequisite: course 22. Offered in odd-numbered years.

170. Leibniz (4) III. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: course 22. Offered in even-numbered years

171. Hobbes (4) III. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: course 22 recommended. Offered in even-numbered years.

172. Locke (4) III. Malcolm
Lecture-discussion—3 hours. Offered in even-numbered years.

173. Berkeley (4) II. Matthey
Lecture-discussion—3 hours; term paper. Prerequisite: course 23. Offered in even-numbered years.

174. Hume (4) I, Arbini
Lecture-discussion—3 hours. Offered in even-numbered years.

175A. Kant (4) I, Matthey
Lecture-discussion—3 hours; written reports. Prerequisite: course 23. Offered in even-numbered years.

175B. Kant (4) II. Matthey
Lecture-discussion—3 hours; written reports. Prerequisite: course 175A. Offered in even-numbered years.

176. Hegel (4) II. Bossart
Lecture-discussion—3 hours. Prerequisite: courses 23 and 175A-175B recommended. Offered in even-numbered years.

178. Kierkegaard (4) II. Child
Lecture-discussion—3 hours; term paper. Prerequisite: one course in Philosophy recommended. Offered in even-numbered years.

181. Heidegger (4) III. Child
Lecture-discussion—3 hours. Prerequisite: course 23, 151, or 175A-175B recommended. Offered in even numbered years.

***190. Special Topics in the History of Philosophy** (4) II. Matthey
Lecture-discussion—3 hours; term paper. Intensive study of special topic, problem, or authors in the history of philosophy. May be repeated 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)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

Graduate courses 201, 202, 207, 214, and 290 are offered every year by different instructors and may be repeated for credit with consent of the Graduate Adviser. The other graduate courses will be varied from year to year.

***201. Metaphysics** (4) II. Child
Seminar—3 hours.

***202. Theory of Knowledge** (4) II. Arbini
Seminar—3 hours.

206. Philosophical Argumentation (4) I, Arbini
Seminar—3 hours. Prerequisite: graduate standing. Investigation and evaluation of philosophical arguments. Critical discussion of student papers on various aspects of philosophical disputes.

***207. Philosophy of Science** (4) III. Friedman
Seminar—3 hours.

***214. Ethics** (4) I, Berger
Seminar—3 hours.

***223. Aesthetics** (4) II.
Seminar—3 hours. Offered in even-numbered years.

261. Plato (4) II. Malcolm
Seminar 3 hours. Offered in odd-numbered years.

262. Aristotle (4) III. Wedin
Seminar—3 hours. Offered in odd-numbered years.

275. Kant (4) III. Bossart
Seminar—3 hours. Offered in odd-numbered years.

***290. History of Philosophy** (4) II. Matthey
Seminar—3 hours. Special topics in the history of philosophy.

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.)

Physical Education

(College of Letters and Science)

William C. Adams, Ph.D., Chairperson of the Department

Herbert A. Schmalenberger, M.A., Vice-Chairperson of the Department

Department Office, 264 Hickey Gymnasium
(752-0511)

Faculty

William C. Adams, Ph.D., Professor
Richard L. Bell, Ph.D., Professor (*Chemical Engineering*)

*Edmund M. Bernauer, Ph.D., Professor
*Robert R. Brooks, M.A., Supervisor
Joseph E. Carlson, M.A., Supervisor
Stewart E. Cassell, M.S., Lecturer
Jere H. Curry, M.A., Supervisor
Kathleen M. DeYoung, B.A., Assistant Supervisor
Rudy H. Dressendorfer, Ph.D., Lecturer
Robert L. Foster, M.A., Supervisor
Pamela L. Gill, M.A., Associate Supervisor
^{3,4}Raymond S. Goldbar, M.A., Associate Supervisor

Robert I. Hamilton, M.S., Supervisor
Jerry W. Hinsdale, A.B., Supervisor
Barbara A. Jahn, M.S., Assistant Supervisor
Charles R. Kovacic, Ed.D., Professor
Willard S. Lotter, Ed.D., Professor
Paul A. Molé, Ph.D., Associate Professor
Donald G. Morris, B.S., Lecturer
John W. Pappa, M.A., Supervisor
Melvin R. Ramey, Ph.D., Professor (*Civil Engineering*)

E. Dean Ryan, E.D., Professor
Herbert A. Schmalenberger, M.A., Supervisor
Althea E. Short, B.A., Associate Supervisor
Joe L. Singleton, M.A., Supervisor
James L. Sochor, Ed.D., Supervisor
H. Robert Superko, M.D., Lecturer
Phillip S. Swimley, M.A., Supervisor
Jon E. Vochatzer, M.S., Assistant Supervisor
Stephen A. Wallace, Ph.D., Assistant Professor
Marya Welch, Ed.D., Supervisor

The Major Program

The Physical Education major focuses on the biological and psychological aspects of physical activity. A student will elect to specialize in either of these two emphases. Courses are designed to develop and impart a scientific understanding of physical performance in man under a broad spectrum of developmental and stresser states. The major provides the basic education for students planning careers in the area of teacher education and related applied health and sport sciences which require integrative knowledge of human performance.

Physical Education

A.B. Major Requirements:

Preparatory Subject Matter	UNITS
Biological Sciences 1	24
	5

Chemistry 1A	5
Physical Education 45	3
Physics 1A	3
Psychology 1 or 15	4
Statistics 13	4

Depth Subject Matter	47
Human Anatomy 101	4
Human Anatomy 101L	2
Physical Education 101, 102, 103, 104, 105	16
Physiology 110	5

A minimum of 12 upper division units in physical education chosen in consultation with a major adviser

A minimum of 8 upper division units in either the biological or the psychological area selected in consultation with a major adviser

Students are expected to elect, in consultation with a major adviser, either the biological or psychological concentration by the end of the sophomore year. Under special circumstances an individualized curriculum with alternative emphasis may be elected, but only after consultation with and approval by a major adviser.

Total Units for the Major 71

Recommended

Students interested in the physiological aspects of physical education are strongly urged to take Chemistry 8A, 8B.

Major Advisers. W.C. Adams, E.M. Bernauer, C.R. Kovacic, W.S. Lotter, E.D. Ryan, H.A. Schmalenberger, S.A. Wallace.

Teaching Major. The teacher-training curriculum in physical education requires courses in addition to the departmental major requirements.

Teaching Credential Subject Representative. H. A. Schmalenberger. See page 105 for the Teacher Education Program.

Graduate Study. A program of study and research leading to the M.A. degree is available in physical education. For detailed information regarding graduate study, write to the Graduate Adviser, Department of Physical Education.

Graduate Adviser. S.A. Wallace.

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, 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

Lower Division Courses

1. Physical Education for Men and Women (½) I, II, III. The Staff (Chairperson in charge)

Laboratory—2 hours. Section 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, II, III. (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 (Pappa 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.

NOTE: For key to footnote symbols, see page 130.

Physical Education

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) II. Colberg

Lecture—2 hours. Planning and administering intramural sports programs at the high school and college level.

25. Theory of Lifesaving and Water Safety (1) I, II, III. Jahn
Lecture—1 hour; laboratory—2 hours. Prerequisite: sound physical condition, 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 own life or the life of another in an aquatic emergency. (American Red Cross Senior Lifesaving Certificate awarded upon successful completion of necessary requirements.)

27. Training Course for Water Safety Instructors (2) II, III. Hinsdale

Lecture—1 hour; laboratory—2 hours. Prerequisite: advanced swimming and Senior Life Saving Certificate. Theoretical knowledge and practical experience necessary for the organization and teaching of swimming, life saving, and water safety courses. (American Red Cross Water Safety Instructors Certificate awarded upon successful completion of necessary requirements.)

29. Basic Scuba (2) I, III. Morris.

Lecture—2 hours; laboratory—2 hours. Prerequisite: advanced swimming skills equivalent to course 25; diver medical examination; and consent of instructor. Introduction of basic knowledge required for SCUBA diving, function and maintenance of equipment, physics and physiology of diving, safety and first aid, currents and wave action, marine life and underwater communication. Pool and open water sessions available for certification (contact Department Office for details). (P/NP grading only.)

30. Synchronized Swimming Composition (2) I, Jahn

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 1 (synchronized swimming) or consent of instructor. Principles of choreography for solo, duet, and team compositions: style, execution, synchronization. Understanding and appreciation of technical principles of water show productions: basic tools and equipment, principles of set construction, scene painting, costume construction, lighting, and sound equipment.

35A. Dance Composition (2) I, Short

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, Short

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, Short

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-III. Curry

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) I, II, III. Lotter

Lecture—2 hours. Application of scientific and empirical knowledge to personal, family, and community health problems. (P/NP grading only.)

44L. Principles of Teaching Healthful Living (1) I, III. Lotter
Discussion—four 2½ hour evening sessions. Prerequisite: course 44 (concurrently). Course will supplement course 44 by specifically dealing with the principles of teaching healthful living, as covered in the lectures and as found in the California Health Education Framework. Required of all teaching credential students. (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.

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 stu-

dents 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 10; consent of instructor. Tutoring or teachers aide in physical education type activities, including athletic coaching, in public schools under the guidance of a regular teacher with supervision by a departmental faculty person. (P/NP grading only.)

101. Physiological Regulation During Exercise (4) I, Bernauer, Molé

Lecture—3 hours; discussion—1 hour alternate weeks with laboratory 3 hours. Prerequisite: Biological Sciences 1; Physiology 110. A study of muscle/neuromuscle, cardiovascular, body fluids, blood, acid base and respiratory metabolic regulations during acute bouts of exercise and work. Focus on physiological and environmental factors limiting capacity and causing fatigue. Role of physical activity in maintaining optimal regulatory functions.

102. Physiological Adaptations to Exercise (2) II, Bernauer, Adams

Lecture—2 hours. Prerequisite: course 101. Study of the fundamental physiological responses to repeated environmental and exercise stressors. Processes of adaptation as evoked in endurance and strength training, nutrition, and aging process.

103. Analysis of Human Movement (4) I, III. Kovacic

Lecture—3 hours; laboratory—3 hours. Prerequisite: Physics 1A; Human Anatomy 101; course 45 and consent of instructor. Anatomical and physiological concepts and physical laws as applied to human movement.

104. Introduction to Motor Control and Skill Acquisition (3) I, Wallace

Lecture—3 hours. Prerequisite: Psychology 1, 15, or 16. Analysis of variables affecting man's 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) I, Ryan

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: course 101, 102; Chemistry 1A. 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, Bernauer

Lecture—2 hours; discussion—½ hour; laboratory—1½ hours. 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 limitations and adaptations, will be studied.

112. Clinical Exercise Testing (3) III, Dressendorfer

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 101, 102. Exercise testing of apparently healthy individuals and patients with heart or lung disease: physiological rationale, clinical indications, and practical application. Use of exercise tests to quantify training programs for developing and maintaining physical fitness in adults.

113. Growth and Development in Human Performance (3) I, Molé, Adams

Lecture—3 hours. Prerequisite: Biological Sciences 1, Human Anatomy 101, and Physiology 110. 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.

120. Sports in American Society (4) III, Gill

Lecture—4 hours. Historical development of sport: the phenomenon of play, games and non-structured sport. The national and international rules and interrelationship of American sports, its socio-cultural aspect, current trends, problems and issues.

121. Sports Psychology (4) II, Ryan

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.

125. Human Performance and Motor Learning (3) II, Wallace

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 104 and Psychology 1; Psychology 130 recommended. Information processing in skill acquisition. Open and closed-loop theory, attention, feedback and other current issues are critically examined.

128A. Research Diving: 65 Feet (1) II, Bell

Lecture—1 hour; laboratory—½ hour. Prerequisite: basic SCUBA Certification from approved agency (course 29 or the equivalent); 10 logged open-water dives since certification; and 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, Bell

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, coldwater 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.)

129. Research Diving: 100 Feet (2) I, Bell

Lecture—3 hours (first five sessions); laboratory—3 hours (final five sessions). Prerequisite: courses 128A-128B or the equivalent; consent of instructor. Lecture and laboratories in the theory and practice of decompression, structure or decompression tables, use of hyperbaric chambers, instruction and use of decompression stations. Pool and open water sessions available for certification (contact Department Office for details). (P/NP grading only.)

131. Physical Education for the Handicapped (4) II, Kovacic, 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, Pappa

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. Conditioning of Athletes: The Prevention and Care of Sports Injuries (2) I, II, Pappa

Lecture—1 hour; laboratory—2½ hours. Prerequisite: course 5 or the equivalent. An understanding of the use of various types of exercises prior to competition; understanding prime injury areas of participants in all activities and how to handle them.

140. Principles and Theory of Physical Education (4) II, Lotter

Lecture—4 hours. Prerequisite: course 45 or consent of instructor. Critical analysis of the assumptions underlying the physical education program.

141. Design and Program Evaluation in Physical Education (4) III, Wallace

Lecture—3 hours; laboratory—3 hours. Prerequisite: basic statistics course; consent of instructor. Topics include data reduction and analysis; test selection, construction and administration; grading; and teacher evaluation.

142. Physical Education in the Public Schools (3) II, Schmalenberger

Lecture—3 hours. Prerequisite: course 140 and senior standing or consent of instructor. Analysis and study of the principles and methods basic to teaching physical education at the elementary and secondary levels.

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.

197T. Tutoring in Physical Education (1-5) I, II, III. The Staff (Chairperson in charge)
Tutorial—1-5 hours. Prerequisite: consent of instructor. 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.)

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

200. Proseminar in Physical Education (3) I, Adams, Ryan
Seminar—3 hours. Prerequisite: course 141. The meaning, methods, and techniques of research procedure as applied to physical education; a critical review of selected studies, literature, practices, and procedures in the field; application to a particular problem in the field.

201A. Sports Medicine: Medical Aspects of Sports Injuries (3) I. The Staff (Riggins, Orthopaedic Surgery, in charge)
Lecture—2½ hours; discussion—½ hour. Prerequisite: graduate students with upper division course in systemic physiology or anatomy. A multidisciplinary course introducing the student to 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. (S/U grading only.) (Same course as Orthopaedic Surgery 401A, Physical Medicine and Rehabilitation 201A, 401A.)

201B. Sports Medicine: Physiological Basis of Exercise Testing and Exercise Training (3) II. The Staff (Bernauer in charge)
Lecture—2 hours; two 4-hour laboratory projects; discussion—four 2-hour sessions. Prerequisite: graduate students with upper division course in systemic physiology and anatomy. Course introduces the student to methods and assessment of exercise physiology and exercise testing. Principles of exercise training for normal individuals and patients with various diseases and weight reduction and control will be discussed. (S/U grading only.) (Same course as Orthopaedic Surgery 401B, Physical Medicine and Rehabilitation 201B, 401B.)

201C. Sports Medicine: Special Problems in Prescribing and Appraising Exercise Programs (3) III. The Staff (Bernauer in charge)
Lecture—2 hours; two 4-hour laboratory projects; discussion—four 2-hour sessions. Prerequisite: graduate students with upper division course in systemic physiology and anatomy. Review of special problems related to specific sports and recreational activities. Areas to be covered include SCUBA diving, backpacking, jogging and skiing as well as specific exercise programs for disabled and aged. (S/U grading only.) (Same course as Orthopaedic Surgery 401C, Physical Medicine and Rehabilitation 201C, 401C.)

***215. Growth and Development in Human Performance** (4) III.
Seminar—4 hours. Prerequisite: course 113. Graduate lecture-seminar investigating the interrelationships between growth and development, and physical activity. Alterations in body composition, motor performance and physiological function with age, and the special problem areas of sex, ethnic and racial differences, aging, athletics, and alteration of normal growth patterns.

220. Kinesiology (4) III. Kovacic
Lecture—3 hours; discussion—1 hour. Prerequisite: course 103 and consent of instructor. Critical review of current literature and research in kinesiology; neurophysiological concepts and physical laws.

***221. Anthropometry in Physical Activity** (3) II. 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 composition changes accompanying prolonged, systematic physical conditioning. Offered in even-numbered years.

***222. Metabolic Functions in Exercise** (4) III. Molé
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 102, Physiology 114. 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.

230. Motor Performance: Psychological Aspects (4) II. Ryan
Lecture—2 hours; discussion—2 hours. Prerequisite: course 105. Critical review of current literature on motor learning; coordination; kinesthesia; and reaction time; consideration of sensory-motor perception, motivation, and personality factors in relation to physical activities.

231. Seminar in Motor Control of Voluntary Movements (3) III. Wallace
Seminar—3 hours. Prerequisite: Physiology 112, 214, or the equivalent; Physical Education 104, 125 or consent of instructor. A neurophysiological and behavioral examination of motor control in the human and higher phylogenetic animal.

290. Physiological Basis of Physical Fitness (2) II. Bernauer
Seminar—2 hours. Prerequisite: graduate standing. Review and critical discussion of current research topics concerned with the physiological aspects of physical fitness. Offered in odd-numbered years.

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 Course

380. Methods of Teaching Physical Education (3) III. Schumalenburger
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 142 and six units of course 10; 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)

William J. Knox, Ph.D., Chairperson of the Department

Wendell H. Potter, Ph.D., Vice Chairperson of the Department

Department Office, 225 Physics-Geology Building (752-1500)

Faculty

Franklin P. Brady, Ph.D., Professor
Thomas A. Cahill, Ph.D., Professor
Albert C. Cheung, Ph.D., Associate Professor
Lawrence B. Coleman, Ph.D., Assistant Professor

Linton R. Corruccini, Ph.D., Associate Professor
James E. Draper, Ph.D., Professor
Glen W. Erickson, Ph.D., Professor
Ching-Yao Fong, Ph.D., Professor
Milton E. Gardner, Ph.D., Professor Emeritus
Claude Garrod, Ph.D., Professor

^{2,3}Kenneth R. Greider, Ph.D., Professor
John F. Gunion, Ph.D., Professor
James P. Hurley, Ph.D., Associate Professor
John A. Jungerman, Ph.D., Professor
William J. Knox, Ph.D., Professor
Winston T. Ko, Ph.D., Associate Professor
^{2,3}Richard L. Lander, Ph.D., Professor
Douglas W. McCoim, Ph.D., Associate Professor
Charles G. Patten, Ph.D., Professor Emeritus
¹Neal Peek, Ph.D., Lecturer
David E. Pellett, Ph.D., Associate Professor
Wendell H. Potter, Ph.D., Associate Professor
Roderick V. Reid, Jr., Ph.D., Associate professor
¹William W. True, Ph.D., Professor
Philip M. Yager, Ph.D., Associate Professor

The Program of Study

While many people think of Physics as levers and pulleys or space shots and atomic reactors, there is much more to the realm of physics. From the smallest subatomic particles to atoms, molecules, stars, and galaxies, the study of Physics is the study of what makes the universe tick. For example the working of the airplane, the paint sprayer, and the pitcher's curve ball are all understood in terms of the same physical law. 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.

As the world becomes more and more complex, the sciences appear to become more difficult to understand. Yet appearances can be deceiving, and many of the most complex phenomena and devices are easily understood and used by those with a good understanding of the basic principles of physics. A major in Physics or in Applied Physics at UC Davis provides a student with this basic knowledge, plus experience in using that knowledge, to get the most out of today's technical world.

Careers in Physics and Applied Physics. The science of Physics involve the observation of natural phenomena and events. From these observations comes the mathematical formulation of general principles which may be tested further or applied to specific problems. Because physics is so basic to other sciences, its study provides a background with broad flexibility for later activities.

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 or in Applied 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, and computer science, materials science and energy.

The Major Programs

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 A.B. program is preferred for a student seeking a secondary teaching credential. Either the B.S. in Physics or 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.

Physics

Both programs are developed in a highly sequential manner, i.e., Physics 8A-8B-8C-8D and Mathematics 21A-21B-21C and 22A-22B-22C are required for most upper division courses and must be taken in the freshman and sophomore years. Some prerequisites may be waived with consent of the instructor.

In the freshman year, Astronomy 2 and Physics 7 are recommended for the student who wishes to take some classes in this department prior to enrolling in Physics 8 in the Spring Quarter. These courses are introductory to the department and are not preparatory to Physics 8. Honors mathematics is highly recommended for both the freshman and sophomore years.

In the junior year the student normally studies mathematical methods, analytical mechanics, electricity and magnetism, and begins quantum mechanics. In the senior year the study of quantum mechanics is continued and courses in the principal modern fields of physics are selected. Laboratory courses may be taken both years.

Physics

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	37
Physics 8A, 8B, 8C, 8D	16
Mathematics 21A, 21B, 21C, 22A, 22B, 22C	21
Depth Subject Matter	38
Physics 104A, 104B, 105A, 105B, 110A, 110B, 112A, 115A, 122	26
At least 7 units from Physics 105C, 110C, 112B, 115B, 129A, 129B, 129C, 140A, 140B	7
At least 5 additional upper division units in physics or astronomy. (No more than 4 units in courses numbered 194, 195, 197T, 198, and 199 may be applied in satisfaction of this requirement.)	5
Total Units for the Major	75

Recommended

Chemistry 1A-1B-1C or 4A-4B-4C. See also recommended elective courses following the B.S. program.

Physics

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	52
Physics 8A, 8B, 8C, 8D	16
Mathematics 21A, 21B, 21C, 22A, 22B, 22C	21
Chemistry 1A-1B-1C or 4A-4B-4C	15
Depth Subject Matter	54
Physics 104A, 104B, 105A, 105B, 110A, 110B, 110C, 112A, 115A, 115B, 122	33
At least 11 units from Physics 105C, 112B, 129A, 129B, 129C, 140A, 140B	11
At least 10 additional upper division units from physics or astronomy. (No more than 6 units in courses numbered 194, 195, 197T, 198, and 199 may be applied in satisfaction of this requirement.)	10
Total Units for the Major	106

Recommended Electives

Astronomy: Astronomy 2;
Computer and numerical analysis: Mathematics 29 or Engineering 5, Mathematics 128A or Engineering — Applied Science 115;
Statistics: Statistics 131A;
Advanced mathematics: Mathematics 101, 108A, 118A-118B, 119, 120, 121A-121B, 127A-127B-127C, 185A-185B; Physics 10 (history and philosophy of physics). Prior approval needed for credit.

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.

Applied Physics

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	56
Physics 8A, 8B, 8C, 8D, 60 (not required of upper division transfer students)	17
Mathematics 21A, 21B, 21C, 22A, 22B, 22C	21
Mathematics 29 or Engineering 5	3
Chemistry 1A-1B-1C or 4A-4B-4C	15
Depth Subject Matter	50
Physics 104A, 104B, 105A, 105B, 110A, 110B, 112A, 115A, 116A, 116B	32
At least 18 units from approved courses within one of the following specializations chosen in consultation with a major adviser	18
Materials Science, Physical Electronics, Energy, Applied Nuclear Physics, Chemical Physics, Atmospheric Physics, Geophysics, Physical Oceanography, Applied Mathematical Physics. (Lists of approved courses in each specialization with representative programs are available from the Physics Department.)	

Total Units for the Major **106**

Major Advisers. Contact Departmental Office for adviser assignment.

Minor Program Requirements

Three distinct minors are offered, all requiring prerequisites equivalent to Mathematics 21A-21B-21C and 22A-22B-22C and Physics 8A-8B-8C-8D. Students considering the possibility of becoming a Physics *major* should consult with a Physics major adviser before beginning work in one of these minor programs.

	UNITS
Classical Physics	21-22
Physics 104A, 105A, 105C, 110A-110B, plus two additional upper division physics courses which must include either 108 or 112A or both	21-22
(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 really require 105B first.)	

	UNITS
Quantum Physics	20
Physics 104A-104B, 112A, 115A-115B, plus at least one quarter from 121, 129A-129B-129C, 140A-140B	20
(Physics 104A-104B must precede 115A-115B; and 115A must precede 140A or 129B.)	

	UNITS
General Physics	24
Physics 104A-104B, 105A, 110A-110B, 112A, 115A, plus another upper division physics course	24
(Physics 104A-104B must precede 115A.)	

Teaching Credential Subject Representative. R. V. Reid. See page 105 for the Teacher Education Program.

Graduate Study. The Department of Physics offers programs of study and research leading to the M.A. 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 Astron-

omy Club. The graduate program in physics provides research opportunities in radio-astronomy or microwave astrophysics.

Courses in Astronomy

Lower Division Courses

2. Introduction to Modern Astronomy and Astrophysics (4) I. Cheung

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. Introduction to General Astronomy (4) III. Cheung
 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).

Upper Division Course

127. Introduction to Astrophysics (3) II. Cheung
 Lecture—3 hours. Prerequisite: Physics 8B, Mathematics 21C and knowledge of astronomy or consent of instructor. Celestial mechanics, radiation, astrophysical measurements, electromagnetic processes, the sun, binary and variable stars, stellar structure and evolution, galaxies, cosmology. (Same course as Physics 127.)

Courses in Physics

Physics 10 is primarily a concept-oriented one-quarter lecture/discussion course requiring relatively little mathematical background.

Physics 7 is a one-quarter descriptive course intended to inform prospective physics majors about the various fields of physics now under intensive study.

Physics 1 is a two-quarter sequence requiring some mathematics (trigonometry). Either 1A alone or both 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 2 is a three-quarter sequence using some calculus (mostly concepts rather than calculations). The entire sequence is recommended, rather than just 1 or 2 quarters. Physics 3 is a separate laboratory course recommended to accompany Physics 2.

Physics 8 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. Applied Physics (3) I. McCoolm
 Lecture—3 hours. Prerequisite: trigonometry or consent of instructor. Mechanics, electrical energy. Not open to students who have completed course 2A (or former 2ATA).

1B. Applied Physics (3) II. Potter
 Lecture—3 hours. Prerequisite: course 1A (or 2A and consent of instructor). Heat, optics, radiation. Not open to students who have completed course 2B or 2C.

2A. General Physics Lecture (3) I, II. The Staff
 Lecture—3 hours. Prerequisite: Mathematics 16A (may be taken concurrently) or consent of instructor. Mechanics. Introduction to general principles and analytical methods used in physics. Not open to students who have received credit for course 1A.

- 2B. General Physics Lecture** (3) II, III. The Staff
Lecture—3 hours. Prerequisite: course 1A or 2A and consent of instructor. Electricity and magnetism, heat, kinetic theory, and thermodynamics. Not open to students who have completed course 1B.
- 2C. General Physics Lecture** (3) I, III. The Staff
Lecture—3 hours. Prerequisite: course 2B. Wave motion, optics modern physics. Not open to students who have received credit for course 1B.
- 3A. General Physics Laboratory** (1) I, II. The Staff
Laboratory—2 hours. Prerequisite: course 2A (may be taken concurrently) or consent of instructor. Mechanics. Experimental work planned to accompany the lectures in course 2A. Recommended for students electing course 2A.
- 3B. General Physics Laboratory** (1) II, III. The Staff
Laboratory—2 hours. Prerequisite: course 3A. Electricity and magnetism, heat, kinetic theory, and thermodynamics. Experimental work planned to accompany the lectures in course 2B. Recommended for all students who take course 2B.
- 3C. General Physics Laboratory** (1) I, III. The Staff
Laboratory—2 hours. Prerequisite: course 3B. Wave motion, optics, modern physics. Experimental work planned to accompany the lectures in course 2C. Recommended for all students who take course 2C.
- 7. Contemporary Directions in Physics** (1) II. McCoim
Lecture—1 hour; one hour field trip to campus laboratory. A series of talks by invited speakers describing the various fields now under intensive study: high energy physics, nuclear, atomic and condensed matter physics. Interdisciplinary fields, such as atmospheric physics, will also be discussed. (P/NP grading only.)
- 8A. Classical Physics** (4) III. The Staff
Lecture—3 hours; discussion—1 hour; laboratory—2 hours. Prerequisite: Mathematics 21B (may be taken concurrently). Mechanics.
- 8B. Classical Physics** (4) I. The Staff
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 8A, Mathematics 21C, and 22C (may be taken concurrently). Fluid mechanics; electricity and magnetism, including circuits and Maxwell's equations.
- 8C. Classical Physics** (4) II. The Staff
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 8B; Mathematics 22B (may be taken concurrently). Heat and thermodynamics; waves, including sound and electromagnetic waves; geometric and physical optics.
- 8D. Modern Physics** (4) III. The Staff
Lecture—3 hours; discussion—2 hours. Prerequisite: course 8C and Mathematics 22B; Mathematics 22A (may be taken concurrently) recommended. Physics since 1900: special relativity, quantum mechanics, atoms, molecules, the solid state, nuclei and particle physics.
- 10. Basic Concepts of Physics** (4) I, II. Greider
Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra; students having had any other physics course must have departmental approval prior to enrolling. 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.
- 60. Introduction to Applied Physics** (1) III. Coleman
Lecture—1 hour. Prerequisite: course 8D (may be taken concurrently). A series of lectures describing current fields of research in applied physics. Topics covered will include materials science, physical electronics, energy, applied nuclear physics, chemical physics, atmospheric physics, physical oceanography, and applied mathematical physics. (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)
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: course 8B, Mathematics 22C. Elements of vector and tensor analysis, matrix methods, boundary value problems, integral transforms with applications to physics.
- 105A. Analytical Mechanics** (3) I, Ko
Lecture—3 hours. Prerequisite: course 8A; Mathematics 22A, 22B, 22C. Principles and applications of Newtonian mechanics.
- 105B. Analytical Mechanics** (3) II, Ko
Lecture—3 hours. Prerequisite: courses 8C and 105A. Continuation of course 105A; introduction to Lagrange's and Hamilton's equations.
- 105C. Continuum Mechanics** (3) III. Yager
Lecture—3 hours. Prerequisite: courses 104B, 105A. Continuum Mechanics.
- 108. Optics** (3) III. Cahill
Lecture—3 hours. Prerequisite: course 8 or 2 sequence and Mathematics 21 sequence or consent of instructor. The phenomena of diffraction, interference, and polarization of light, with applications to current problems in astro-physics, material science, and atmospheric science. Study of modern optical instrumentation. Open to non-majors.
- 108L. Optics Laboratory** (1) III. Cahill
Laboratory—3 hours. Prerequisite: current enrollment in 108. 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. Jungerman
Lecture—3 hours. Prerequisite: course 8C; Mathematics 22C. Theory of electrostatics, electromagnetism, Maxwell's equations, electromagnetic waves.
- 112A-112B. Thermodynamics and Statistical Physics** (3-4) I-II. Potter
Lecture—3 hours (112A); lecture—3 hours plus 9 hours outside work (112B). Prerequisite: course 8; Mathematics 22C. Thermodynamics, kinetic theory, and introduction to statistical mechanics.
- 115A-115B. Introduction to Quantum Mechanics** (3-4) I-II. Draper
Lecture—3 hours (115A); lecture—3 hours plus problem sets (115B). Prerequisite: courses 8D, 104B, 105B. The classical background, basic ideas, and methods of quantum mechanics, with applications to atomic physics.
- 116A. Electronic Instrumentation** (4) II. Ko
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 8C, Mathematics 22B. An experimental and theoretical study of important electronic circuits commonly used in physics.
- 116B. Electronic Instrumentation** (4) III. Pellet
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 8D, 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. McCoim
Lecture—3 hours; outside work—9 hours. Prerequisite: course 8D; 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.
- 122. Advanced Physics Laboratory** (2) I, II. The Staff
Discussion—1 hour; laboratory—3-6 hours. Prerequisite: course 8. Experimental techniques and measurements in atomic, nuclear, and solid-state physics. May be repeated once for credit.
- 123. Applications of Nuclear Physics** (3) I, Jungerman
Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Applications to environmental, medical, and energy source problems. Course emphasizes but is not limited to experimental programs underway at Crocker Nuclear Laboratory. Student participation in one such experimental program is the required lab work.
- 127. Introduction to Astrophysics** (3) II. Cheung
Lecture—3 hours. Prerequisite: course 8B and Mathematics 21C and knowledge of astronomy or consent of instructor. Celestial mechanics, radiation, astrophysical measurements, electromagnetic processes, the sun, binary and variable stars, stellar structure and evolution, galaxies, cosmology. (Same course as Astronomy 127.)
- 129A. Introduction to Nuclear and Particle Physics** (4) I, Lander
Lecture—3 hours; term paper. Prerequisite: course 8D; Mathematics 22C. Survey of basic nuclear properties and concepts requiring only rudimentary knowledge of quantum mechanics.
- 129B. Nuclear Physics** (4) II. Draper
Lecture—3 hours; outside work—9 hours. Prerequisite: courses 115B, 129A, Continuation of course 129A.
- 129C. Elementary Particle Physics** (4) III. Ko
Lecture—3 hours; term paper. Prerequisite: courses 115A and 129A or consent of instructor. Properties and classification of elementary particles. Strong, electromagnetic, and weak interactions; conservation laws and CPT invariance; Quarks.
- 140A. Introduction to Solid-State Physics** (4) II. Coleman
Lecture—3 hours; outside work—9 hours. Prerequisite: course 115A. A survey of basic concepts and classification of experimental phenomena in solids. Introduction to band theory.
- 140B. Introduction to Solid-State Physics** (4) III. Coleman
Lecture—3 hours; outside work—9 hours. Prerequisite: course 140A. A thorough treatment of one or more of the following: energy bands and fermi surfaces, transport phenomena, cooperative phenomena, magnetic resonance.
- *150. Topics in Current Research** (2) I, II, III. The Staff
Discussion—1 hour; outside work—5 hours. Prerequisite: consent of instructor. Discussion of topics of current interest in physics. May be taken for credit not more than four times.
- 153. Introduction to Heat Transfer** (2) I, McCoim
Lecture—1 hour; outside readings and extensive problem sets. Prerequisite: courses 104A-104B, 105A-105B, 115A; 112A (may be taken concurrently). Fundamentals of conductive convective and radiative heat transfer with an emphasis on the solution of practical problems involving the combined modes of conduction and convection. Viscous fluid dynamics pertinent to convective heat transfer.
- 194H. Special Study for Honors Students** (4) I, II, III. The Staff (Chairperson in charge)
Prerequisite: open only to seniors who qualify for the honors program. Independent research and/or reading on selected topics.
- 195. Senior Thesis** (5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: physics major or 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 16 units and for no more than 5 units in any one quarter without Departmental approval.
- 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** (3) I, Garrod
Lecture—3 hours. Prerequisite: courses 105C and 110C or the equivalent; Mathematics 220A (concurrently). Special theory of relativity, covariant formulation of mechanics and electromagnetic theory, Lagrange's equations, variational principles for discrete and continuous mechanical and electromagnetic systems. Courses 200A, 200B, 200C, 200D, an integrated sequence will emphasize physical content as they are coordinated with Mathematics 220A, 220B, 220C.
- 200B. Theory of Mechanics and Electromagnetics** (3) II, Garrod
Lecture—3 hours. Prerequisite: course 200A; Mathematics 220B (concurrently). Hamilton's equations. Hamilton-Jacobi theory and contact transformations, action-angle variables and perturbation theory, selected topics in mechanics of continuous media; incompressible and compressible flow, gravity waves and shock theory.
- 200C. Theory of Mechanics and Electromagnetics** (3) III, True
Lecture—3 hours. Prerequisite: course 200B, Mathematics 220C (concurrently). Brief review of static electromagnetic fields; Maxwell's equations; plane waves in various media; magnetohydrodynamics.
- 200D. Theory of Mechanics and Electromagnetics** (3) I, True
Lecture—3 hours. Prerequisite: course 200C. Diffraction theory. Radiating systems and electron theory.
- 215A. Quantum Mechanics** (3) I, True
Lecture—3 hours. Prerequisite: course 115B. Nonrelativistic quantum mechanics. Formal development and interpretation of quantum mechanics, including the Schrödinger wave equation, matrix mechanics, and use of state vectors in describing a dynamical system.
- 215B. Quantum Mechanics** (3) II, True
Lecture—3 hours. Prerequisite: course 215A. Wave packets, Wentzel-Kramers-Brillouin approximation, and perturbation methods applied to atomic, nuclear, molecular, and solid-state problems.

NOTE: For key to footnote symbols, see page 130

215C. Quantum Mechanics (3) III. True
Lecture—3 hours. Prerequisite: course 215B. Scattering theory, radiation theory, and a brief introduction to relativistic quantum mechanics and the Dirac equation.

219A. Statistical Mechanics (3) I, Garrod, Hurley
Lecture—3 hours. Prerequisite: courses 112B and 115B. Foundations of classical and quantum statistical mechanics.

219B. Statistical Mechanics (3) II. Hurley, Garrod
Lecture—3 hours. Prerequisite: course 219A. Applications to properties of solids, real gases, nuclear matter, fluctuations about the equilibrium state.

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.

223. Group-Theoretical Methods of Physics (3) III. Fong
Lecture—3 hours. Prerequisite: courses 215A-215B-215C or consent of instructor. Theory of groups and their representations with applications in selected areas of physics.

***224A. Nuclear Physics** (3) I. Brady, 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. Not offered every year.

***224B. Nuclear Physics** (3) II. Draper, Brady
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) III. 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) I. Reid
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) II. Reid
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, Erickson
Lecture—3 hours. Prerequisite: course 215C. Relativistic quantum mechanics of particles; techniques and applications of second quantization; Feynman diagrams; renormalization. Not offered every year.

230B. Quantum Theory of Fields (3) II. Erickson
Lecture—3 hours. Prerequisite: course 230A. Continuation of 230A, with selected advanced topics, such as S-matrix theory, dispersion relations, axiomatic formulations. Not offered every year.

***239A. Quantum Many-Body Systems** (3) II. Garrod
Lecture—3 hours. Prerequisite: courses 215C and 219B. The quantum theory of many-particle systems. Theoretical analysis of superfluids, superconductors, and nuclear matter.

***239B. Quantum Many-Body Systems** (3) III. Garrod
Lecture—3 hours. Prerequisite: course 239A. Perturbation and variation techniques in many-particle systems. Band theory of solids, electron-phonon interactions, and other topics.

***240A-240B. Solid-State Physics** (3-3) I-II. Fong
Lecture—3 hours. One electron model of solids: transport properties; optical properties, properties of lattice waves; electron-phonon interaction; superconductivity, magnetism, non-crystalline solids.

245A-245B. High Energy Physics (3-3) I-II. Ko
Lecture—3 hours. Prerequisite: course 215A. Systematics of elementary particle interactions; determination of quantum numbers; interpretation of experiments; selected special topics in second quarter. Not offered every year.

250. Special Topics in Physics (3) I. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Topic varies from year to year. May be repeated three times for credit.

251. Special Topics in Applied Physics (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Topic varies from quarter to quarter. May be repeated three times for credit. Not offered every quarter.

252. Techniques of Experimental Physics (3) III. Potter
Lecture—3 hours. Introduction to techniques and methods of designing and executing experiments. Problems and examples will be drawn from various fields of current experimental research — low temperature solid state to high energy scattering experiments.

290. Seminar (1-3) I, II, III. The Staff (Chairperson in charge)
Seminar—1-3 hours. (S/U grading only.)

291. Seminar in Nuclear Physics (1-2) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

292. Seminar in Theoretical Physics (1-2) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

293. Seminar in Solid-State Physics (1-2) I, II, III. Fong, Potter
Seminar—1-2 hours. (S/U grading only.)

294. Seminar in Applied Physics (1-2) I, II, III. The Staff (Chairperson in charge)

Seminar—1-2 hours. Presentation and discussion of current topics in applied physics by visiting lecturers, staff and students. (S/U grading only.)

297. Techniques of Teaching Physics (3) III. Greider
Prerequisite: consent of instructor and Department Chairperson. Study of devices and methods used to teach physics at the college level. Participation in presenting lectures and demonstrations in undergraduate classes. Preparation of new material for 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 (1-2) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Physiological Sciences

(School of Veterinary Medicine)

Richard A. Freedland, Chairperson of the Department

Department Office, 2163 Haring Hall (752-1373)

Faculty

Richard L. Bell, Ph.D., Professor (*Chemical Engineering*)

Arthur L. Black, Ph.D., Professor

Victor W. Burns, Ph.D., Professor

Gaylord M. Conzelman, Jr., Ph.D., Associate Professor

Donald L. Curry, Ph.D., Associate Professor

Richard A. Freedland, Ph.D., Professor

Jerry R. Gillespie, D.V.M., Ph.D., Professor

Shri N. Giri, B.V.Sc., A.H., Ph.D., Associate Professor

Marvin Goldman, Ph.D., Professor (*Radiological Sciences*)

Robert J. Hansen, Ph.D., Associate Professor

Benjamin L. Hart, D.V.M., Ph.D., Professor

Alfred A. Heusner, Docteur-es-Sciences, Professor

Robert M. Joy, Ph.D., Associate Professor

James G. Morris, Ph.D., Professor (*Animal Science*)

Stuart A. Peoples, M.D., Professor Emeritus

Quinton R. Rogers, Ph.D., Professor

Henry J. Segall, Ph.D., Assistant Professor

Courses in Physiological Sciences

Upper Division Courses

101A-101B. Physiological Chemistry (4-3) I-II. Black
Lecture—4-3 hours. Prerequisite: organic chemistry. Recommended: a course in physiology (may be taken concurrently) and quantitative analysis. Chemical and physical properties of substances comprising the animal body, with major emphasis on the changes during metabolism and factors influencing these reactions. Biochemistry of the endocrine glands and other specialized tissues and body fluids; chemistry of respiration, energy metabolism and nutrition.

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200. Cell Physiology: Biophysical Aspects (2) III. Burns
Lecture—2 hours. Prerequisite: consent of instructor. Recommended: Physiology 100B or Bacteriology 130B; Biochemistry 101B and Chemistry 107B or 110C. Discussion of modern approaches to understanding the cell as an organized system. Topics include analysis of regulation and coordination in the cell; energetic and statistical relations in the cell; tracer kinetics applied to cells; fluorescence of cells and constituents. Offered in even-numbered years.

***205A. Intermediary Metabolism of Animals** (3) I, Black
Lecture—3 hours. Prerequisite: biochemistry and physiology or consent of instructor. General consideration in use of 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.

205B. Intermediary Metabolism of Animals (3) II. Hansen, Rogers

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.

223. Comparative Pharmacology (5) III. Giri, Conzelman, Joy

Lecture—4 hours; laboratory—3 hours. Prerequisite: biochemistry and mammalian physiology. Action of drugs on the physiological mechanisms of animals.

243A-243B. Use of Isotopes as Tracers in Biological Research (2-2) I-II. Burns

Lecture—2 hours. Prerequisite: biochemistry or physiological chemistry, elementary physics and calculus or consent of instructor. Discussion of the properties of isotopes and their use as tracers in biological systems.

243L. Laboratory in Use of Isotopes as Tracers in Biological Research (2) II. Burns

Laboratory—6 hours. Prerequisite: course 243B (concurrently). Study of radioisotope properties, uses and measurement methods relevant to the biological sciences.

253. Drug Metabolism (2) II. Giri
Lecture—2 hours. Prerequisite: courses 101A-101B or Physiology 110A-110B; consent of instructor. General pathways of drug metabolism; and factors influencing the drug metabolism. Emphasis will be laid upon the species, age, and genetic differences affecting the biological disposition of the drugs. Offered in even-numbered years.

***255. Pharmacogenetics** (2) II. Peoples, Giri
Lecture—1 hour, laboratory—3 hours. Prerequisite: consent of instructors. The genetic basis of interspecific and intraspecific differences in animals to the action of drugs. The laboratory exercises are designed to illustrate these differences and their biological basis.

257. Pharmacology Literature (1) I, Conzelman
Discussion—1 hour. Critique of selected papers in pharmacology with the objective of discerning those general principles, techniques, and guides for procedures which successful investigators have found helpful in the pursuit of their research. Offered in even-numbered years.

258. Drug Receptors (2) II. Joy
Lecture—2 hours. Prerequisite: Pharmacology 200A-200B or the equivalent. Theories of drug-receptor interactions and their application to known receptor systems are stressed. Present concepts of adrenergic, cholinergic, opiate, and other receptors are considered in conjunction with their functional importance.

259. The Use of Antimicrobial Drugs in the Management of Infectious Diseases of Small Animals (2) III. Conzelman, Enos, Hirsch, Ling

Lecture—1 hour, discussion—1 hour. Prerequisite: third-year standing in the School of Veterinary Medicine. Course structured to reinforce and integrate students' knowledge of microbiology, pharmacology and clinical medicine. Lectures and discussions will focus on the rational use of antimicrobial drugs in the management of infectious diseases of small animals. (S/U grading only.)

260. Comparative Bioenergetics (4) II. Heusner
Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 107A. Fundamentals of thermodynamics and their application in physiology; entropy, probability, information, and thermodynamic potentials. Theory of biological similarity; dimensional analysis, poikilothermy, heterothermy, homeothermy, and biological time.

***280. Advanced Pulmonary Physiology** (3) I, Gillespie
Lecture—3 hours. Prerequisite: graduate student status or consent of instructor. Advanced study of physiology of mammalian respiration with emphasis on mechanisms of ventilation, gas distribution, diffusion and blood perfusion.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge) Seminar—1 hour.

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.)

Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis.

Physiology

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
Preparatory Subject Matter	47
Chemistry (Chemistry 1A-1B-1C, 5, 4A-4B-4C)	25
Mathematics (Mathematics 16A-16B, 16C, Statistics 13)	13
Physics (Physics 2A-2B-2C)	9
Depth Subject Matter	33
Physiology, including, Physiology 100A-100B, 100L, 110, 110L, 111A-111B	33
Breadth Subject Matter	
<i>College of Agricultural and Environmental Sciences students</i>	16
Social sciences and humanities (see College requirement)	16
Additional requirements as described on page 70.	
<i>College of Letters and Science students:</i> Refer to page 93 for a description of requirements to be completed in addition to the major.	
Restricted Electives	30
Upper division units, chosen with adviser's approval, constituting a sequence in biochemistry, morphology, and selected biological science courses or mathematics, chemistry, physics, and/or engineering. No course 192 or more than 5 units of a course 199 will be accepted as restricted electives.	
Unrestricted Electives	54
Total Units for the Major	180

Major Adviser. H. W. Colvin.

Graduate Study. The Physiology Department offers programs of study and research leading to the M.S. and Ph.D. degrees. Information on graduate study can be obtained from the graduate adviser or the *Announcement of the Graduate Division*.

Graduate Advisers. A-F: W. Adams (Physical Education); G-K: B.A. Horwitz (Animal Physiology); L-P: J.W. Evans (Animal Science); Q-Z: R. Carlsen (Human Physiology).

Related Course. Human Physiology 200D (Medicine, School of).

Courses in Physiology

Lower Division Courses

See also *Physiology 2, 2L, and 10 listed under the Department of Zoology course listing (page 310)*.

Upper Division Courses

100A. General Physiology (3) I, Horwitz
Lecture—3 hours. Prerequisite: Biological Sciences 1 and Chemistry 8B; Physics 2C recommended. Examination of the interaction of various intracellular compartments in the functioning of the animal cell. Emphasis is placed on metabolic bases and regulation of cellular function. Cell and tissue structure are discussed in relation to physiological mechanisms.

100B. General Physiology (3) II, Horwitz, Horowitz
Lecture—3 hours. Prerequisite: course 100A. Continuation of course 100A with particular emphasis on transport phenomena, cell recognition and communication, and properties of excitable cells.

100L. General Physiology Laboratory (2) II, Horwitz, Horowitz
Discussion—five 2-hour sessions (alternate weeks); laboratory—five 6-hour sessions (to alternate with discussion). Prerequisite: courses 100A, 100B (concurrently), Biological Sciences 1; or consent of instructor. Laboratory in the physical and chemical processes of cells and tissues.

102. Physiology of Growth (3) I, A. Smith
Lecture—3 hours. Prerequisite: course 110. The nature of the growth of cells, organs, organisms and population, and their regulatory processes. Emphasis is placed on the quantitative evaluation of growth.

***103. Physiology of Animal Cells** (4) II, B. Wilson
Lecture—4 hours. Prerequisite: course 100B or Zoology 121B. Organization of metazoan systems at the cellular level. Life cycles of cells; regulation and development of specialized cell functions.

106A. Experiments in Physiology: Design and Execution (3) III. The Staff (Horwitz, Horowitz in charge)
Discussion—total of 6 hours; laboratory—7-9 hours. Prerequisite: course 100A, 100B, 100L and consent of instructor. Allows students to experimentally examine current physiological problems. Following group discussions on approaches to designing experiments, groups of 2-3 students will choose a project and design an experimental protocol that they will then carry out and report upon. (P/NP grading only.)

106B. Experiments in Physiology: Design and Execution (3) I. The Staff (Horwitz, Horowitz in charge)
Discussion—two 2-hour meetings during quarter, laboratory—9 hours. Prerequisite: course 106A and consent of instructor. Continuation of course 106A. (P/NP grading only.)

***108. Biodynamics** (3) I, Horowitz
Lecture—3 hours. Prerequisite: course 100A or 110; Mathematics 16A, 16B. Application of mathematics to physiological processes.

110. Systemic Physiology (5) I, II, III, Barkley, Colvin, Goldberg, Mendel, Sillman, Weidner, Woolley
Lecture—5 hours. Prerequisite: Biological Sciences 1. Physiology of organ systems; including concepts of integrative and homeostatic mechanisms.

110L. Systemic Physiology Laboratory (2) I, III, Barkley, Goldberg, Sillman
Discussion—1 hour; laboratory—3 hours. Prerequisite: course 110 prior to taking 110L recommended, but 110 may be taken concurrently. Selected experiments to illustrate functional characteristics of organ systems discussed in course 110.

111A-111B. Advanced Systemic Physiology Laboratory (3-3) II-III, Burger
Lecture—1 hour, discussion—five 2-hour sessions (to alternate with laboratory); laboratory—five 6-hour sessions. Prerequisite: course 110; courses 112, 113, 114 recommended. Selected experiments in depth on the neural, cardiovascular, respiratory, renal, and endocrine systems. Emphasis on modern conceptual and methodological approaches using several species in demonstrating the physiology of organ systems.

112. Neural and Endocrine Control Systems† (4) I, Boda, Horowitz
Lecture—4 hours. Prerequisite: course 110. The nature, functional significance, and integration of neuronal and endocrine control of physiological processes. Emphasis will be placed on neuroendocrine, neural sensory, and motor systems, higher neural integration, and control of metabolic and reproductive status.

113. Cardiovascular, Respiratory, and Renal Physiology† (4) II, Goldberg, Weidner
Lecture—4 hours. Prerequisite: course 110; Chemistry 8B, Physics 2A, 2B, 2C 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.

114. Gastrointestinal Physiology† (2) III, Mendel
Lecture—2 hours. Prerequisite: course 110; Biochemistry 101 or Physiological Chemistry 101 recommended. Advanced gastrointestinal physiology covering absorption, secretion, endocrine, and motility. Also includes physiology of herbivore digestive tracts. The emphasis will be on physiology of the gastrointestinal tract; however, the interface between the tract and metabolic events will be briefly covered.

†This course is in a group from which one or more may be chosen; however, to be considered as having had full exposure to advanced systemic physiology a student must take courses 112, 113, 114, 120A, 121, 121L, and 130. A student with special interests in comparative physiology may wish to select courses from the 120 series.

Physiology

See below; and also Human Physiology (Medicine), Plant Physiology, and Zoology

Physiology

(College of Agricultural and Environmental Sciences)

Faculty

See under Departments of Animal Physiology, Animal Science, and Avian Sciences.

The Major Program

The Physiology major is designed to provide an understanding of the vital functions of living organisms and includes a systematic study of the functional properties of tissues and organs and comparison of processes among different kinds of animals. It will provide the foundations for a challenging career in physiology and also serve 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.

Choice of College. The Bachelor of Science degree is offered in both the College of Agricultural and Environmental Sciences and College of Letters and Science.

Students majoring in Physiology in the College of Letters and Science may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC

NOTE: For key to footnote symbols, see page 130

Physiology

- 117. Avian Physiology** (3) III. Burger
Lecture—3 hours. Prerequisite: course 110 or Zoology 2. Physiology of the various systems of birds with emphasis on digestion, respiration, excretion, and the endocrine system.
- 117L. Avian Physiology Laboratory** (2) III. Burger
Discussion—five 2-hour sessions; laboratory—five 6-hour sessions. Prerequisite: course 117 (may be taken concurrently). Laboratory instruction in selected organ systems of the bird.
- 120A. Comparative Physiology: Neurointegrative Mechanisms** (3) I. Woolley
Lecture—3 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom: neurointegrative mechanisms of integration including aspects of phylogenetic development at both neuronal and systemic levels.
- 120B. Comparative Physiology: Circulation** (3) II. Goldberg, Rhode
Lecture—3 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom: circulation. Comparative approach to cardiovascular function in vertebrates and invertebrates. Offered in odd-numbered years.
- 120C. Comparative Physiology: Digestion** (3) III. Colvin
Lecture—3 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom: digestion. Offered in even-numbered years.
- 120D. Comparative Physiology: Humoral Integrative Mechanisms** (3) II. Boda
Lecture—3 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom: humoral integrative mechanisms. Offered in even-numbered years.
- 120E. Comparative Physiology: Respiration** (3) II. A. Smith, Burger
Lecture—3 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom: respiration. Offered in even-numbered years.
- 120F. Comparative Physiology: Osmoregulatory Mechanisms** (2) II. Boda
Lecture—2 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom: osmoregulatory mechanisms. Offered in odd-numbered years.
- 121. Physiology of Reproduction** (3) II. Cupps
Lecture—3 hours. Prerequisite: course 110. Physiological mechanisms related to reproduction, breeding efficiency, and fertility, with special reference to domestic animals.
- 121L. Physiology of Reproduction Laboratory** (1) II. Cupps
Laboratory—3 hours. Prerequisite: course 121 (may be taken concurrently) recommended. Experiments on the reproductive systems of domestic animals including male and female gametes. (P/NP grading only.)
- 130. Physiology of the Endocrine Glands** (5) I, Moberg
Lecture—4 hours; discussion—1 hour. Prerequisite: course 110. Control of endocrine secretion and physiological effects of the hormones.
- 147. Aviation Physiology** (3) II. A. Smith
Lecture—3 hours. Prerequisite: course 110. The nature and physiological consequences of the aviation environment (altitude, acceleration, motion, etc.) and of protective devices (oxygen equipment, G-suits, etc.). Field trips will be available (as course 198) to visit operational aviation physiology installations. Offered in odd-numbered years.
- 148. Principles of Environmental Physiology** (3) II.
Lecture—3 hours. Prerequisite: course 110. Intensive treatment of basic aspects of environmental physiology: introduction to physiological control mechanisms; special emphasis on adaptation to the environment.
- *149. Environmental Physiology of Domestic Animals** (3) III. Weathers
Lecture—3 hours. Prerequisite: courses 110-110L, or Zoology 2. Influences of environmental factors on physiological processes related to animals including man. The nature of environmental variations which influence physiological responses are given emphasis.
- *190. Proseminar in Physiology** (3) II, B. Wilson
Seminar—3 hours. Prerequisite: upper division standing. Relationships between form and function of living systems from the molecular to the organismal levels, with emphasis upon animal systems.
- 192. Internship** (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in all subject areas offered in physiology. (P/NP grading only.)
- 196. Voluntary Control of Physiological Processes** (2-5) I, II, III. Lorenz
Discussion—1 hour; laboratory—3-12 hours. Prerequisite: adequate preparation in physiology, behavioral science, computer science, physics or electrical engineering and consent of instructor. Individual or team projects in voluntary control of physiological process emphasizing application of micro-computer-assisted biofeedback techniques. May be repeated for credit. (P/NP grading only; deferred grading can be in effect.)
- 197T. Tutoring in Physiology** (2) I, II, III. The Staff (Woolley in charge)
Discussion—1 hour; tutorial—1 hour. Prerequisite: course 110 or 113 (with grade of B or better) and consent of instructor. Extensive review of systemic physiology through leading a weekly tutorial session with a small group of students taking course 110. Course format will vary with background of tutors and instructional needs. (P/NP grading only.)
- 198. Directed Group Study** (1-5) I, II, III. The Staff (Woolley in charge)
(P/NP grading only.)
- 199. Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Woolley in charge)
(P/NP grading only.)
- Graduate Courses**
- 200A, 200B. Advanced General Physiology** (3-3) I, II, B. Wilson, Sillman, Traut (Biological Chemistry)
Lecture—2 hours; discussion—1 hour. Prerequisite: courses in undergraduate biochemistry and cell biology, or general physiology, or consent of instructor. Current topics in the physico-chemical bases of living systems with emphasis on regulation of cell processes. Courses 200A and 200B may be taken in either order; may be repeated for credit.
- *200L. Advanced General Physiology Laboratory** (4) I, B. Wilson
Discussion—2 hours; laboratory—10 hours. Prerequisite: course 100B or Zoology 166, Biochemistry 101B or consent of instructor. The design, performance and interpretation of experiments in cellular and general physiology. Emphasis on growth, division, differentiation, permeability, conduction and other physiological phenomena. Experimental materials include free-living and somatic animal cells and animal tissues.
- *211. Graduate Systemic Physiology Laboratory** (5) I, Horowitz
Lecture—2 hours; laboratory—9 hours. Prerequisite: course 113. Advanced treatment of systemic physiology, with special emphasis on current developments; laboratory exercises illustrating modern physiological concepts and procedures.
- 212. Gastrointestinal Physiology of Single-Stomached Animals** (3) II. Mendel, Colvin
Lecture—3 hours. Prerequisite: course 114 or 120C; Biochemistry 101B or Physiological Chemistry 101B. Consideration of the physiological mechanisms, biochemistry and endocrinology of the gastrointestinal tract, pancreas and liver as they relate to the assimilation of food. Offered in odd-numbered years.
- 214. Neurophysiology** (4) II.
Lecture—4 hours. Prerequisite: courses 112, 111B; consent of instructor. Electrical activity of neurons and neuroeffector junctions; physiology of the nervous system as studied by its electrical activity. Offered in odd-numbered years.
- 215. Neurophysiology Laboratory** (3) I, Horowitz
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. Offered in odd-numbered years.
- 216. Neurophysiology Literature** (2) III.
Discussion—2 hours. Prerequisite: course 214. Critical reading and group discussion of current and classic original papers in neurophysiology.
- 217. The Vertebrate Eye** (3) II. Sillman
Lecture—3 hours. Prerequisite: course 112 or the equivalent. The vertebrate eye will be considered from the standpoint of its physiology, biochemistry, and biology. Retinal functions and mechanisms will be stressed, with particular emphasis on the photoreceptors. Offered in even-numbered years.
- 219. Muscle Growth and Development** (3) II. Ashmore, B. Wilson
Lecture—2 hours; seminar—1 hour. Prerequisite: Biochemistry 101B; Zoology 100, 121A; 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 odd-numbered years.
- 220. General and Comparative Physiology of Reproduction** (3) I, Ogasawara, Cupps, Anderson, Stabenfeldt (Reproduction)
Lecture—3 hours. Prerequisite: courses 110, 110L; Biochemistry 101B; Genetics 100B. 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.
- 221. The Ruminant Stomach** (3) III. Colvin
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110L and Physiological Sciences 101B or Biochemistry 101B or consent of instructor. Ruminant stomach anatomy, histology, and physiology. Original literature will be emphasized. Offered in odd-numbered years.
- 225. Physiology of Lactation** (4) II. Baldwin
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110; Biochemistry or Physiological Sciences 101B. Consideration of the biochemical, genetic, physiological, nutritional and structural factors determinant of mammary gland development, lactogenesis and milk yields and composition; animal physiological adaptations to lactation; mammary cancer research; and, research perspectives in mammary research.
- 231. Neuroendocrinology** (4) II. Woolley, Moberg
Lecture—3 hours; discussion—1 hour. Prerequisite: course 130. Neural-endocrine interactions; neural regulation of endocrine systems; hormonal modifications of neural development and activity. Offered in even-numbered years.
- *234. Neurophysiological Basis of Neurotoxicology** (2) II. Woolley
Lecture—1½ hours; discussion—½ hour. Prerequisite: course 110 or the equivalent; consent of instructor. Mechanisms of action of a number of different neurotoxins, including marine toxins, insecticides and heavy metals. Examples of ways toxins may act on the nervous system and techniques for study of neurotoxicology. Offered in odd-numbered years. (Same course as Environmental Toxicology 234.)
- 242. Physiological Rhythmicity** (1) I, Winget
Lecture—1 hour. General aspects and basic mechanisms of biological rhythms; the importance of rhythm desynchronization in areas of pharmacology and space medicine; telemetry; mathematical methods; chronometry; tidal, lunar, and annual periods; periodic desynchronization. Offered in odd-numbered years.
- 250. Development of Physiological Concepts: Selected Topics** (3) I. The Staff (Woolley in charge)
Lecture—2 hours; discussion—1 hour. Historical development of physiology. Selected topics from ancient to modern times. Course may be repeated for credit when a different topic is studied. (S/U grading only.)
- 275. Neurohumoral Regulatory Mechanisms of Thermogenesis** (3) II. Horwitz, Horowitz
Lecture—2 hours; discussion—1 hour. Prerequisite: course 100A (or the equivalent), Biochemistry/Physiological Chemistry 101A (or the equivalent), and 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 (Woolley in charge)
Seminar—1 hour. Discussion and critical evaluation of advanced topics and current trends in research. (S/U grading only.)
- 297T. Tutoring in Physiology** (3) I, II, III. The Staff (Woolley 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 (Woolley in charge)
- 299. Research** (1-12) I, II, III. The Staff (Woolley in charge)
(S/U grading only.)
- Professional Course**
- 300A-300B. Pedagogical Aspects of Physiology in Higher Education** (3-5) I, II, III. The Staff (Mendel in charge)
Lecture, discussion, or laboratory, or combination. Prerequisite: a Ph.D. candidate and qualification as T.A. in physiology. Participation as T.A. for one quarter in designated physiology course is required: attend lectures, lead discussion groups, be available for students' questions, study laboratory material, help prepare laboratory exercises in-

cluding pre-runs when necessary, develop competence in laboratory procedures and techniques, and prepare and correct quizzes. (S/U grading only.)

Plant Pathology

(College of Agricultural and Environmental Sciences)

James E. DeVay, Ph.D., Chairperson of the Department
Department Office, 354 Hutchison Hall
(752-0301)

Faculty

Edward E. Butler, Ph.D., Professor
Robert N. Campbell, Ph.D., Professor
James E. DeVay, Ph.D., Professor
John M. Duniway, Ph.D., Associate Professor
W. Harley English, Ph.D., Professor Emeritus
David G. Gilchrist, Ph.D., Assistant Professor
Austin C. Goheen, Ph.D., Lecturer
Raymond G. Grogan, Ph.D., Professor
Dennis H. Hall, Ph.D., Lecturer
William B. Hewitt, Ph.D., Professor Emeritus
Clarence I. Kado, Ph.D., Professor
John M. Klisiewicz, Ph.D., Lecturer
Tsune Kosuge, Ph.D., Professor
Lysle D. Leach, Ph.D., Professor Emeritus
Bert Lear, Ph.D., Professor
James D. MacDonald, Ph.D., Assistant Professor
(*Plant Pathology, Environmental Horticulture*)
Srecko M. Mircetich, Ph.D., Lecturer
William J. Moller, Ph.D., Lecturer
George Nyland, Ph.D., Professor
Joseph M. Ogawa, Ph.D., Professor
Mary Ann Sall, Ph.D., Assistant Professor
William C. Schnathorst, Ph.D., Lecturer
Thomas A. Shalla, Ph.D., Professor
Robert J. Shepherd, Ph.D., Professor
Robert K. Webster, Ph.D., Professor
Edward E. Wilson, Ph.D., Professor Emeritus

Related Major Program. See the major in Plant Science (page 276).

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 page 99.

Graduate Advisers. E.E. Butler, J.M. Duniway, J.M. Ogawa.

Courses in Plant Pathology

Upper Division Courses

120. Introduction to Plant Pathology (4) I, Gilchrist; III, Campbell
Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 2; Bacteriology 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.

130. Physiology of Fungi (3) I, DeVay
Lecture—3 hours. Prerequisite: Botany 2; Biochemistry 101B and Botany 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.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: course 120 and consent of instructor. Work-learn 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

205. Diseases of Vegetable and Field Crops (4) III-Extra-session summer. Grogan, Webster
Lecture—2 hours and laboratory—6 hours (alternate weeks through first Summer Session). Prerequisite: course 120; Botany 119. Study of vegetable and field crops diseases with emphasis on recognition and diagnosis, etiology, epidemiology, and control. (Deferred grading only, pending completion of course.) Course 206 may be taken concurrently.

206. Diseases of Fruit, Nut, and Vine Crops (4) III-Extra-session summer. Ogawa
Lecture—2 hours and laboratory—6 hours (alternate weeks through first Summer Session). Prerequisite: course 120; Botany 119. Clinical study of fruit, nut, and vine crops diseases with emphasis on etiology, epidemiology, diagnosis, and control. (Deferred grading only, pending completion of course.) Course 205 may be taken concurrently.

208. Ecology of Plant Pathogens and Epidemiology of Plant Disease (3) I, Duniway
Lecture—3 hours. 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.

210. Physiology and Biochemistry of Host-Pathogen Interaction (4) II, Kosuge
Lecture—3 hours; discussion—1 hour. Prerequisite: course 130 or the equivalent; Biochemistry 101B. Discussion of the nature of host-pathogen interactions, metabolic alterations in plant disease, biochemistry of disease resistance, toxins in plant disease.

215. Genetics of Plant Pathogens (4) II, Webster
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 120; Genetics 100B; Botany 119. Study of fundamental concepts, research techniques and current information on the genetics of plant pathogenic microorganisms; origin and determination of physiologic specialization, host resistance and virulence in the pathogen as related to the host-parasite interaction. Special emphasis on the fungi.

224. Pathogenic Fungi (5) III, Butler
Lecture—3 hours; laboratory—6 hours. Prerequisite: Botany 119. Morphology and taxonomy of plant pathogenic fungi.

226. Plant Virology (5) II, Shalla, Shepherd
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.

228. Plant Bacteriology (5) I, Kado
Lecture—2 hours; laboratory—9 hours. Prerequisite: course 120; Bacteriology 2 or the equivalent; Biochemistry 101A, 101B. 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.

235. Special Topics in Advanced Plant Pathology (4) I, Grogan, Webster
Lecture—2 hours; discussion—2 hours. Prerequisite: consent of instructors. Advanced study of the factors influencing pathogenicity and development of diseases in plants.

290. Seminar (1) I, Mircetich; II, Campbell; III, Shepherd
Seminar—1 hour. (S/U grading only.)

291. Seminar in Host-Parasite Physiology (1) I, DeVay; II, Kado
Seminar—1 hour. Prerequisite: course 120. (S/U grading only.)

292. Seminar in Plant Virology (1) II, III.
Seminar—1 hour. Prerequisite: course 226. Review and evaluation of current literature and research in virology. (S/U grading only.)

295. Seminar in Mycology (1) I, Butler; III, Wells
Seminar—1 hour. Review and evaluation of current literature and research in mycology. (S/U grading only.) (Same course as Botany 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 Botany for undergraduate majors, and below for graduate study.

Plant Physiology (A Graduate Group)

Barbara D. Webster, Ph.D., Chairperson of the Group
Group Office, Hunt Hall (*Agronomy and Range Science*) (752-2468)

Graduate Study. The Graduate Group in Plant Physiology offers programs of study and research leading to the M.S. and Ph.D. degrees. Detailed information can be obtained from the Group Chairperson and the *Announcement of the Graduate Division*.

Graduate Adviser. B. D. Webster (*Agronomy and Range Science*).

Courses in Plant Physiology

Graduate Courses

298. Group Study (1-5) I, II, III. The Staff (Webster in charge)
Prerequisite: graduate standing. Organized group study and discussion of topics relevant to the professional field of Plant Physiology.

299. Research (1-12) I, II, III. The Staff (Webster in charge)
Prerequisite: graduate standing. (S/U grading only.)

Plant Protection and Pest Management (A Graduate Group)

Steven R. Radosevich, Ph.D., Chairperson of the Group
Group Office, 155 Robbins Hall (752-2405)

Graduate Study. The Graduate Group in Plant Protection and Pest Management offers programs of study and research leading to the M.S. degree. Detailed information can be obtained from the Group Chairperson and the *Announcement of the Graduate Division*.

Plant Science

Graduate Adviser. O. G. Bacon (*Entomology*).

Courses in Plant Protection and Pest Management

Graduate Courses

201. Concepts and Systems of Plant Protection and Pest Management (3) II. Sall (Plant Pathology)

Lecture—2 hours; discussion—1 hour. Prerequisite: Entomology 110 or 112, Plant Pathology 120, Botany 120 (may be taken concurrently), Nematology 100; Botany 117 or Zoology 125 recommended. Ecological perspective of agricultural systems, the role of pests in these systems, plant protection and pest management methods as modifiers of the systems and their components.

202A-202B-202C. Diagnosis of Plant Pest Problems and the Control of Causal Agents (3-3-3) I, Norris (Botany); II, Nyland (Plant Pathology); III, Lange (Entomology)

Fieldwork—9 hours. Prerequisite: Entomology 110 or 112, Plant Pathology 120, Botany 120, Nematology 100 (Botany or Nematology may be taken concurrently). Diagnosis of 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, IV. The Staff (Chairperson in charge) (S/U grading only.)

sales positions in agricultural business and associated enterprises, such as banking and equipment and supply companies, as well as in private, state and federal service in consulting and research.

Plant Science

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
Common Core Courses	91-94
English (English 1, 2, 20 or 103)	4
Rhetoric (Rhetoric 1, 3, Philosophy 5)	4
Economics (Economics 1A or 1B)	5
Physics (Physics 1A, 1B)	6
Statistics (Agricultural Science and Management 150)	4
General chemistry (Chemistry 1A, 1B)	10
Organic chemistry (Chemistry 8A, 8B)	6
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Plant science (Plant Science 2)	4
Soil science (Soil Science 2, 2L)	4
Social sciences and humanities electives (see page 70)†	6
Weed science (Botany 120)	3
Entomology (Entomology 110 or 112)	4
Plant pathology (Plant Pathology 120)	4
Plant physiology (Botany 111A, 111B)	6
Genetics (Genetics 120 or 100A-100B)	4-6
Plant nutrition (Plant Science 116)	4
Water science (Water Science 104 or 110A)	3-4

Depth Subject Matter 45

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 23

Agricultural Economics 130, 140, 150; Agricultural Engineering Technology 102, 103, 104, 105; Agricultural Practices 49A, 49B; Animal Science 2, 111, 114, 116; Atmospheric Science 105; Nematology 100, 110; Plant Pathology 125; Plant Science 102, 103, 113; Soil Science 102, 120, 122, 150; Water Science 103, 110B, 172.

Courses offered in other production departments (e.g., Vegetable Crops, Pomology, Viticulture and Enology, etc.) or in Range Management may be selected in consultation with adviser to satisfy specific individual goals.

Natural sciences electives, not to exceed 8 units, may also be included (see page 70).

Floriculture/Nursery Management Option

Specific course requirements	27
Environmental Horticulture 6, 105, 120, 125, 126, 133	20
Plant Science 102, 109	7

Additional courses to be selected with consent of the adviser from the following 19

Agricultural Economics 18, 112, 113, 114; Agricultural Engineering Technology 114; Agronomy 100; Bacteriology 3; Botany 105, 111L; Economics 11A, 11B; Environmental Horticulture 107, 115, 130A, 130B, 155; Environmental Planning and Management 20, 154A; Geography 3; Plant Pathology 125; Plant Science 101, 112, 112L, 113; Pomology 102; Psychology 144; Soil Science 109; Vegetable Crops 100; Viticulture and Enology 116A.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Courses offered in the natural sciences may be selected in consultation with adviser (see page 70) to satisfy specific individual goals.

Landscape Horticulture Option

Specific course requirements	30
Environmental Horticulture 6, 105, 120, 130A, 130B, 133, 155	20
Environmental Planning and Management 20, 154A	6
Plant Science 102	4

Additional courses to be selected with consent of the adviser from the following 15

Agricultural Economics 18, 112, 114; Agronomy 100; Botany 105; Economics 11A, 11B; Environmental Horticulture 107, 115, 125, 126; Environmental Planning and Management 22, 144; Geography 3; Plant Pathology 125; Plant Science 101, 109, 113; Pomology 101; Soil Science 109; Vegetable Crops 100; Wildlife and Fisheries Biology 10.

Courses offered in the natural sciences may be selected in consultation with adviser (see page 70).

Plant Pathology Option

Specific course requirements	46
Bacteriology 2, 3	4
Biochemistry 101A, 101B	6
Botany 105, 119	10
Chemistry 1C, 5	9
Mathematics 16A, 16B	6
Nematology 100	4
Plant Pathology 125, 130	7

Plant Science Option

Specific course requirements	53-54
Calculus (Mathematics 16A, 16B)	6
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, 130A-130B)	3-4
Pomology (Pomology 101, 102)	4
Vegetable crops (Vegetable Crops 100)	3
Viticulture (Viticulture 100)	3
Biochemistry (Biochemistry 101A, 101B)	6
Environmental toxicology (Environmental Toxicology 101)	3
Soils (Soil Science 109)	4

Pomology Option

Specific course requirements	14
Pomology 101, 102	8
Plant Science 109, 112	6

Additional courses to be selected with consent of the adviser from the following 31

Agricultural Economics 112, 114, 140; Agricultural Engineering Technology 101; 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 3; Soil Science 102, 109, 121, 150; Vegetable Crops 100, 118; Viticulture and Enology 116A, 116B; Water Science 110B.

Natural sciences electives, not to exceed 8 units, may also be included (see page 70)

Vegetable Crops Option

Specific course requirements	13
Vegetable Crops 100 and/or 101	3-4
Soil Science 109	4
Additional units from Vegetable Crops 105, 118, 150, 197 or Plant Science 112	6
Additional courses to be selected with consent of the adviser from the following	32
Agricultural Economics 112, 114, 140; Agronomy 100, 111, 113; Biochemistry 101A, 101B, 101L; Geography 3; Nematology 110; Plant Science 102, 103, 109, 112L, 113; Soil Science 102, 111, 150; Vegetable Crops 198, 199.	
Natural sciences electives, not to exceed 8 units, may also be included (see page 70).	

Plant Science

(College of Agricultural and Environmental Sciences)

Faculty

For faculty in departments offering areas of specialization (Depth Subject Matter) in Plant Science, see under Departments of Agronomy and Range Science; Botany; Environmental Horticulture; Plant Pathology; Pomology; Vegetable Crops; and Viticulture and Enology.

The Major Program

The objective of the Plant Science major is to train students in the biological and natural sciences as applicable to the technology required for the production, protection, and maintenance of crop plants.

The Plant Science student may choose to specialize in one of the seven departmentally associated options or may choose general education by electing the *general* Plant Science option.

The Master Adviser serves as adviser for all students who opt for the Plant Science major. Following commitment to one option, the student is assigned to an adviser associated with the department offering expertise in that area. The general option which includes two or more areas of specialization is administered by the Master Adviser.

Upon graduation, students may qualify for a career in their area of specialization or for advanced study leading to the M.S. or Ph.D. degrees. Each of the (UCD) Departments of Agronomy, Plant Pathology, and Vegetable Crops offer an M.S. degree in their respective fields, while the M.S. degree in Horticulture is available through the Departments of Environmental Horticulture, Pomology, and Viticulture and Enology.

Occupational opportunities exist in nursery and green house management, farming, technical and

Viticulture Option

Specific course requirements 15
 Viticulture and Enology 3, 100, 105, 116A,
 116B 15
 Additional courses to be selected with
 consent of the adviser from the following 30
 Agricultural Economics 130, 140;
 Agricultural Engineering Technology
 101; Agricultural Practices 49A, 49B;
 Atmospheric Sciences 105; Geography
 3; Nematology 110; Plant Science 101,
 102, 103, 109, 113; Soil Science 102,
 109, 150; Viticulture and Enology 123,
 124, 126, 208; Water Science 110B.
 Natural sciences electives, not to exceed 8
 units may also be included (see page
 70).

Unrestricted Electives (units needed to total 180) **32-46**
Total Units for the Major 180

Major Adviser. F. D. Howard (*Vegetable Crops*).

Related Courses. See under Agronomy, Environmental Horticulture, Plant Pathology, Pomology, Vegetable Crops, Viticulture and Encology.

Courses in Plant Science

Questions pertaining to the following courses should be directed to the instructor or to the Academic Advising Center, 122 Hoagland Hall.

Lower Division Courses

- 1. Plants and Man** (3) I, II. Howard (*Vegetable Crops*)
 Lecture—3 hours. Plants as a basic resource for food, fiber, shelter, and recreation; their use and effect on man, past, present, and future.
- 2. Production of Cultivated Plants** (4) I, III. Howard (*Vegetable Crops*), Linder (*Viticulture*)
 Lecture—1 hour; discussion—1 hour; laboratory—3 hours; V.A.S.T.—2½ hours. Principles of plant production, improvement, propagation, harvesting, preserving, processing and marketing. Course will proceed by the Video-Audio-Self-Tutorial method with students making use of the learning facilities at their own convenience.
- 10. Plants and Man** (3) I, Lyons
 Lecture—3 hours. Prerequisite: high school biology, chemistry and physics are essential. Plants as a basic resource for food, fiber, shelter, recreation and environmental enhancement. Emphasis is placed on food and fiber production and the many uses of plants by man.
- 92. Plant Science Internship** (1-6) I, II, III, summer. The Staff (Department Chairperson in charge)
 Laboratory—3-18 hours. Prerequisite: consent of instructor. Work-learn 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
 Group study of selected topics. Restricted to lower division students. (P/NP grading only.)

Upper Division Courses

- 101. Ecology of Crop Systems** (4) II. Loomis, and Rains (*Agronomy and Range Science*)
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Ecological processes governing the structure and behavior of managed ecosystems. Emphasis on competition, adaptation, photosynthetic production and relations to radiant energy, nutrition, water and temperature and their control in crop production.
- 102. Physiology of Cultivated Plants** (4) III. Sachs (*Environmental Horticulture*), Rappaport (*Vegetable Crops*)
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. The plant as a dynamic unit; physiological processes in the vegetative growth, development, flowering and fruiting of cultivated plants.
- 103. Evolution of Crop Plants** (3) I, Jain
 Lecture—2 hours; discussion—1 hour (a few sessions will be used for laboratory work on plant materials). Prerequisite: course 1; introductory genetics (e.g., Genetics 100B). Diversity and domestication of economic plants; principles of plant evolution; centers of origin, genetic diversity and germ plasm collections; implications in new agricultural developments.

NOTE: For key to footnote symbols, see page 130.

109. Principles of Plant Propagation (3) III. Hartmann and Kester (*Pomology*)
 Lecture—2 hours; laboratory—3 hours. Prerequisite: course 2 or Botany 2 or consent of instructor. Principles and practices of propagating horticultural plants with emphasis on anatomical and physiological relationships.

112. Postharvest Physiology and Handling of Horticultural Commodities (3) I, Morris (*Vegetable Crops*), Nelson (*Viticulture*)
 Lecture—3 hours. Prerequisite: Botany 111B or consent of instructor; course 112L (recommended to be taken concurrently). Physiological processes related to the maturation and senescence of fruits and vegetables; 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, Morris (*Vegetable Crops*), Nelson (*Viticulture*)
 Discussion—1 hour; laboratory—3 hours. Prerequisite: course 112 (may be taken concurrently). Demonstrations and exercises following the subject matter of course 112. One or more field trips to observe commercial practices.

113. Plant Breeding (4) II. Orton
 Lecture—3 hours; demonstration-discussion—2-3 hours. Prerequisite: Genetics 100B or 120 or enrollment in both concurrently. The principles of plant breeding applied to economic crops.

116. Mineral Nutrition of Plants (4) III. Epstein (*Botany, Soils and Plant Nutrition*)
 Lecture—3 hours; laboratory—3 hours. Prerequisite: Botany 111A 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.

***121A-121B-121C. Applied Crop Physiology** (3-3-3) I-II-III. Agronomy and Vegetable Crops Staff
 Lecture—1 hour; laboratory—6 hours. Prerequisite: basic knowledge of botany, chemistry, and horticulture and consent of instructor; elementary plant physiology advisable, and courses 101, 102 recommended (may be taken concurrently). Introduction to research in applied plant physiology with examples drawn primarily from agronomic and vegetable crops. Field and laboratory projects, data reduction, and preparation of suitable reports. Limited enrollment.

122. Physiological Genetics and Crop Plants (3) II, Jones, Stevens
 Lecture—3 hours. Prerequisite: Genetics 100A or 120; Botany 111A, 111B; 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.

130. Plant Growth Kinetics (4) III. Silk
 Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 2, Mathematics 16A, 16B; Botany 105 recommended. Topics include growth curves, developmental indices, growth of the plant axis, leaf expansion, phyllotaxis, and growth of the apex. In laboratory, students plant seeds and use methods described in lecture to analyze quantitative aspects of plant development.

192. Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge)
 Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn 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.)

196. Postharvest Technology of Horticultural Crops (3) III, extra-summer. Kader in charge
 Lecture-discussion-demonstration—5 days; field trip—5 days. An intensive study of current procedures for postharvest handling of fruits, nuts, vegetables, and ornamentals in California. (P/NP grading only.)

197T. Tutoring in Plant Science (1-4) I, II, III. The Staff
 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
 Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

202. Advanced Physiology of Cultivated Plants (3) III. Sachs (*Environmental Horticulture*), Rappaport (*Vegetable Crops*)
 Lecture—1 hour; discussion—1 hour; presence at three lectures and one discussion section of course 102. Prereq-

uisite: course 102; Botany 111A-111B or the equivalent. Case histories of selected topics in physiology of cultivated plants from original literature will be presented. Emphasis will be on analysis of physiological problems and pertinent experiments that contribute to concepts of crop production.

216. Advanced Topics in Mineral Nutrition (4) III. Läuchli
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 116 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.

***221A-221B-221C. Crop Physiology** (3-3-3) I, II, III. Agronomy and Vegetable Crops Staff
 Lecture—1 hour; laboratory—6 hours. Prerequisite: basic knowledge of botany, chemistry, and horticulture and consent of instructor; elementary plant physiology advisable, and courses 101, 102 recommended (may be taken concurrently). Introduction to research in applied plant physiology with examples drawn primarily from agronomic and vegetable crops. Field and laboratory projects, data reduction, and preparation of suitable reports. Limited enrollment.

291. Seminar in Postharvest Biology (1) I, II, III. The Staff (Romani 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)

Randolph M. Siverson, Ph.D., Chairperson of the Department

Department Office, 228 Voorhies Hall (752-0966)

Faculty

¹Lawrence Berman, Ph.D., Assistant Professor
 Edmond Costantini, Ph.D., Professor
 William K. Domke, Ph.D., Assistant Professor
 George W. Downs, Jr., Ph.D., Associate Professor
 Philip L. Dubois, Ph.D., Assistant Professor
 Richard W. Gable, Ph.D., Professor
 Alexander J. Groth, Ph.D., Professor
 Charles M. Hardin, Ph.D., Professor Emeritus
 Clyde E. Jacobs, Ph.D., Professor
 Joyce K. Kallgren, Ph.D., Associate Professor
¹Robert J. Lieber, Ph.D., Professor
 Dale Rogers Marshall, Ph.D., Professor
 Lloyd D. Musolf, Ph.D., Professor
 John R. Owens, Ph.D., Professor
^{3,4}Larry I. Peterman, Ph.D., Associate Professor
 Donald S. Rothchild, Ph.D., Professor
 Randolph M. Siverson, Ph.D., Associate Professor
 Alvin D. Sokolow, Ph.D., Associate Professor
 Larry L. Wade, Ph.D., Professor
 Geoffrey A. Wandersforde-Smith, Ph.D., Associate Professor (*Political Science, Environmental Studies*)
²Marvin Zetterbaum, Ph.D., Professor
 Paul E. Zinner, Ph.D., Professor

The Major Programs

Political Science is the study of politics and political systems at the subnational, 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 Department of Political Science offers two major programs: Political Science and Political Science—Public Service. Both provide students with

Political Science

preparation for subsequent careers as well as with a better understanding of politics in general and of the political systems in which they live.

The major in Political Science aims to provide a broad understanding of political concepts and values, political institutions, political behavior and political processes. It offers excellent preparation and background for later careers in government, politics, law, journalism, business, urban planning, administration and teaching.

The Political Science—Public Service major is designed for students who have a specific interest in a career or other activities in or around government. This undergraduate program can also serve as preparation for enrollment in graduate and professional schools. The major combines regular coursework in political science and related fields with two quarters of public affairs internship for which academic credit is granted. It differs from the regular Political Science major in having the internship as a requirement and in emphasizing upper division course work in functional and substantive policy areas of American Government. The functional areas are policy formulation, implementation, and interpretation and the substantive policy areas include urban, environmental, or others designed by the student and faculty counselors. Courses taken in other departments, for example, Economics, Environmental Studies, Environmental Planning and Management, may also be used to satisfy the major.

Political Science

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	20
Three courses from Political Science 1, 2 or 2D, 3 or 3D, 4 or 4D, 5 or 5D	12
Two courses from History 3, 4A, 4B, 4C, 5, 10, 111A, 111B, 111C, 121A, 121B, 121C, 131A, 131B, 131C, 133, 134A, 134B, 145A, 145B, 146A, 146B, 147A, 147B, 147C, 151A, 151B, 151C	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	24
Group A	
(1) Political theory: Political Science 110-119	
Group B	
(2) American government: Political Science 100-109, 172-174, 191	
(3) Parties and political behavior: Political Science 160-171	
(4) Public law: Political Science 150-159	
(5) Public administration: Political Science 180-189	
Group C	
(6) Comparative government: Political Science 140-149, 176-179	
(7) 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 or 192B 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 5D	4
Two courses from Political Science 2 or 2D, 3 or 3D, 4 or 4D	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, 114.	
Internship, Political Science 192A, 192B, 192C	12
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.)	
Total Units for the Major	60

Fields of Concentration

- (1) *Policy formulation*: Political Science 103, 105, 106, 108, 109, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171; Economics 130.
- (2) *Policy implementation and evaluation*: Political Science 156, 180, 181, 182, 183, 186, 187, 188, 189; Economics 131.
- (3) *Policy interpretation—Substance and procedures (public/pre-law)*: Political Science 151, 152, 153, 156, 157A-157B, 158, 159.
- (4) *Policy areas*:
 - a) Urban policy and implementation. Political Science 100, 101, 102, 191; Economics 125A-125B; Environmental Planning and Management 110; Environmental Studies 162, 173.
 - b) Environmental policy and implementation. Political Science 107, 172; Economics 123; Environmental Planning and Management 125; Environmental Studies 160, 161, 166, 168A-168B, 179.
 - c) ——— policy and implementation. Open field that might include courses relevant to health care, welfare, education, community development, transportation, etc. (requires approval of Public Service adviser).

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, designated in the general Political Science major	24
<i>Plan II</i> : Upper division units in political science, with the approval of the minor adviser	24
This plan does not require a distribution of courses in any particular group inasmuch as the courses chosen will be those most appropriate to the student's academic major.	

Teacher Credential Subject Representative. Consult Departmental Office. See page 105 for 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.

American History and Institutions. This University requirement may be satisfied by passing any one of the following Political Science courses: 1, 5, 5D, 100, 101, 102, 103, 104, 105, 106, 108, 109, 113, 127, 128, 160, 163. (See also page 61.)

Courses in Political Science

Lower Division Courses

1. American National Government (4) I, II. The Staff 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.

2. Introduction to Comparative Politics (4) II, III. The Staff Lecture—3 hours; discussion—1 hour. Prerequisite: not open to students having credit for course 2D. 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.

***2D. Seminar in Comparative Politics (4) I.** The Staff Seminar—2 hours; seminar sections or student-faculty conferences—2 hours. Prerequisite: open to lower-division students with consent of instructor; not open to students having credit for course 2. Introduction to basic concepts in political analysis and application of them in comparative studies of selected countries. Individual or team research projects will be required and constitute a major part of the course.

3. International Relations (4) I, II, III. Lieber Lecture—3 hours; discussion—1 hour. Prerequisite: not open to students having credit for course 3D. International conflict and cooperation, including the Cold War, nuclear weapons, and new techniques for understanding international politics.

***3D. Seminar in International Relations (4) II.** Lieber Seminar—2 hours; seminar sections or student-faculty conferences—2 hours. Prerequisite: open to lower-division students with consent of instructor; not open to students having credit for course 3. Selected problems in International Relations. Individual or team research projects will be required.

4. Basic Concepts in Political Theory (4) I, II. Peterman, Zetterbaum Lecture—3 hours; discussion—1 hour. Prerequisite: not open to students having credit for course 4D. Analysis of such concepts as the individual, community, liberty, equality, justice, and natural law as developed in the works of the major political philosophers.

***4D. Seminar in Basic Concepts of Political Theory (4) III.** Peterman, Zetterbaum Seminar—2 hours. Seminar sections or student-faculty conferences—2 hours. Prerequisite: open to lower-division students with consent of instructor; not open to students having credit for course 4. Analysis of such concepts as the individual, community, liberty, equality, justice, and natural law as developed in the works of major political philosophers, individual or group research projects will be required.

5. Contemporary Problems of the American Political System (4) II. The Staff Lecture—3 hours; discussion—1 hour. Prerequisite: not open to students having credit for course 5D. In-depth treatment of selected problems and issues of American politics, governmental institutions, and policies.

***5D. Seminar in Contemporary Problems of the American Political System (4) III.** The Staff Seminar—2 hours; seminar sections or student-faculty conferences—2 hours. Prerequisite: open to lower-division students with consent of instructor; not open to students having credit for course 5. In-depth treatment of selected problems and issues of American politics, governmental institutions, and policies. Individual or group research projects will be required.

7. The American Legal System (3) III. Jacobs Lecture-discussion—3 hours. Prerequisite: sophomore standing recommended. The law, the courts, and the lawyers. The organization and power of American courts. Public and private law as instruments of policies. The role of lawyers in the American legal system. Offered in even-numbered years.

***9. Introduction to Contemporary Problems of Asia (4) I, II.** Kallgren

Lecture—3 hours; discussion—1 hour. Introduction to modern dilemmas, such as imperialism and nationalism, population demands versus economic development, national liberation and Marxism, as reflected in Asia.

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, II. Sokolow 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, countries, 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. Marshall
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. Marshall
Lecture—4 hours. 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. Comparative State Government and Politics (4) II. Sokolow
Lecture—3 hours; discussion—1 hour. The comparative study of the government and politics of American states, including their constitutional frameworks, their participation in the federal system, the dynamics of governmental institutions, and the behavior of parties and interest groups.

104. California State and Local Government (4) I. The Staff
Lecture-discussion—4 hours. California's constitution, party system, legislature, executive agencies, administration, courts, major public programs and problems, state-local relations, county, city, school and special district governments.

105. The Legislative Process (4) II. Owens
Lecture—3 hours; discussion—1 hour. An 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. Berman
Lecture—3 hours; discussion—1 hour; optional term paper. The American presidency's origins and development; presidential power and influence as manifest in relationships with Congress, courts, parties, and the public in the formulation and administration of foreign and domestic policy; nominations, campaigns, and elections.

107. Environmental Politics and Administration (4) I. Wandersforde-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) I. Downs
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) II. 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.

***110. Contemporary Political Science (4) II.** Downs
Lecture-discussion—4 hours. History, nature, and methodology of the discipline; the problems, schools of thought, and trends within the field at present. Offered in even-numbered years.

111. Systematic Political Science (4) II. Downs
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.** Zetterbaum
Lecture—3 hours; discussion—1 hour. The major contemporary attempts to reformulate traditional democratic theory; attempts to replace traditional theory by conceptual models derived from modern social science findings. Offered in odd-numbered years.

113. American Political Thought (4) I, II. Peterman
Lecture—4 hours. Origins and nature of American political thought. The principles of American thought as they emerge from the founding period to the present. Offered in odd-numbered years.

***114. Quantitative Analysis of Political Data (4) III.**
Lecture—3 hours; term paper. Logic and methods of ana-

lyzing 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 odd-numbered years.

***115. Medieval Political Thought (4) II.** Peterman
Lecture—3 hours; discussion—1 hour. Prerequisite: course 118A. Offered in even-numbered years.

***116. Foundations of Political Thought: A Study in Depth of a Major Political Philosopher (4) II.** Peterman, Zetterbaum
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. Zetterbaum
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. Studies in Modern Political Thought (4) II.** Zetterbaum
Lecture—4 hours. A 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.

121. War (4) III. 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.** Jacobs
Lecture—4 hours. Selected topics in international law; territory, sovereign immunity, responsibility, the peaceful settlement or nonsettlement of international disputes.

123. Theories of International Politics (4) II. Siverson
Lecture—4 hours. Major contemporary approaches to the study of international politics, including balance of power, game theory, Marxist-Leninist theory, systems theory, and decision-making analysis.

124. International Political Economy (4) II. Domke
Lecture—3 hours; discussion—1 hour. Politics of international economic relations. Analysis and evaluation of interaction among national foreign economic policies, international regimes, and transnational flows of goods, services, and capital.

125. National Security Policy (4) I. The Staff
Lecture—3 hours; research assignment. The development of American military policy since 1945. An analysis of the policy of deterrence and the assumptions upon which it is based. Effects of nuclear weapons upon the conduct of war, alliance systems, and the international system. The prospects of security and stability through arms control.

126. Arms Control and Disarmament (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 recommended. Examination of the proposals, problems, and achievements of various efforts to limit the magnitude, type, possession and use of major weapons systems in the period since World War II.

127. Recent American Foreign Policy (4) I. Domke
Lecture—3 hours; discussion—1 hour. Development of American foreign policy in the twentieth century, with emphasis on the transformation of policy during and after World War II. Examination of the internal and international factors influencing policy adoption, retention, and change.

128. Conduct of American Foreign Policy (4) II. Domke
Lecture—3 hours; discussion—1 hour. Examination of roles of individuals and organizations. In the process of U.S. foreign-policy formulation since World War II, relying extensively on case studies and memoirs to illuminate the nature of intragovernmental debate on policy.

129. Special Studies in International Relations (4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. An intensive examination of one or more special problems in international relations. May be repeated once for credit.

131. Soviet Foreign Policy (4) I. Zinner
Lecture—3 hours; discussion—1 hour. The conduct of Soviet foreign relations in contemporary world affairs; ideology and power as mainsprings of policy; foreign policy as an instrument of revolution; the role of diplomacy, economic aid and nuclear armaments. Offered in odd-numbered years.

132. The American Role in East Asia (4) I. Kallgren
Lecture—4 hours. Prerequisite: course 3 recommended. Survey of the role the United States has played in East Asia. The influence on Asian westernization of U.S. governmental East Asian policy, missionaries, traders, and returning students.

133. International Relations: East Asia (4) III. Kallgren
Lecture—4 hours. Prerequisite: course 3 recommended. An analysis of international relations and diplomacy in East Asia. Emphasis upon twentieth century problems with examples from China, Japan, Korea, and Southeast Asia.

134. International Relations in Africa (4) I. Rothchild
Lecture—3 hours; discussion—1 hour. Inter-African state relations, pan-Africanism, regional integration, policies toward South Africa, and relations between African and major non-African powers.

***137. Nationalism and Imperialism (4) I.** Kallgren
Lecture—4 hours. Prerequisite: course 3 recommended. The theory of nation building illustrated by Western and non-Western experience. Offered in even-numbered years.

138. Politics of Development in East Africa (4) III. Rothchild
Lecture—4 hours. Prerequisite: course 134 recommended. An analysis of the developmental process in the region of East Africa. Emphasis will be placed upon colonial impact, socio-economic environment, strategies of development, party systems, bureaucracy and military coups. Course is considered part of a year-long interdepartmental sequence of courses on East Africa, including Anthropology 139B and History 115B.

139. International Relations in West Europe (4) II. Lieber
Lecture—4 hours. 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.

140. Comparative Public Policy (4) II. Groth
Lecture—3 hours; term paper. Ideological orientations, institutions, processes, and public policies of modern states. Emphasis on democratic, socialist, communist and fascist experience.

141. Communist Political Systems (4) III. Zinner
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or 2D 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. Revolution and Political Change (4) I.** Groth
Lecture—4 hours. The attributes, problems, means, and impact of political change through evolution and revolution in the twentieth century. Emphasis upon movements and systems representative of communism, fascism, and nationalism.

***143. Latin American Politics (4) II.** The Staff
Lecture—4 hours. Survey of major issues in government and politics, with emphasis upon participation structure and decision-making processes. Four nations receive intensive study: Mexico, Cuba, Chile, and Brazil.

***144. British Government and Politics (4) II.** Lieber
Lecture—3 hours; discussion—1 hour. The British political system, party and pressure group politics, political culture, evolution of the British Commonwealth. Offered in odd-numbered years.

***145. Government and Politics in Emergent Nations (4) III.** Zinner
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or 2D. 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 even-numbered years.

***146. Contemporary African Politics (4) II.** Rothchild
Lecture—4 hours. 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) III. The Staff
Lecture—4 hours. The evolution, politics, and contemporary problems of selected political systems of Western Europe.

NOTE: For key to footnote symbols, see page 130.

***148A. Government and Politics in East Asia** (4) II. Kallgren
Lecture—4 hours. The structure and evolution of political institutions in China, Japan, and Korea. Emphasis upon such topics as nationalism, political modernization, and ideology up to World War II. Some attention to foreign relations.

148B. Government and Politics in East Asia (4) II. Kallgren
Lecture—4 hours. Prerequisite: course 148A recommended. The structure and evolution of political institutions in China, Japan, and Korea since World War II, with emphasis upon political modernization, ideology, and nationalism. Some attention to foreign relations.

149. International Communism (4) II. Zinner
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 2 or 2D, or 3 or 3D, or consent of instructor. The 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 even-numbered years.

***150. Jurisprudence** (4) II.
Lecture—4 hours. An analysis of the nature and functions of law. Particular attention will be directed to law as an instrument of social control and the relationship between law and morality. Offered in even-numbered years.

151. Civil Rights and the Constitution (4) I. Dubois
Lecture—4 hours. Prerequisite: course 5 or 5D or consent of instructor. The constitutional rights and political possibilities of minority groups. Citizenship in the American federal system. Offered in even-numbered years.

***152. The Politics of Justice** (4) III. Dubois
Lecture—3 hours; discussion—1 hour. Criminal and civil justice in America with emphasis upon such problems as legal representation for the poor, control of law enforcement processes, and problems in imprisonment and rehabilitation.

153. Due Process of Law and the Constitution (4) II. Dubois
Lecture—3 hours; discussion—1 hour. Study of the procedural and substantive meaning of the concept of "due process of law" under the U.S. Constitution. Major focus on the protections of the Bill of Rights and the Due Process Clause of the 14th Amendment in the area of criminal procedure.

156. Administrative Law (4) I, Musolf
Lecture—1 hour; discussion—3 hours. The political-legal factors in the decision-making processes of administrative legislation, adjudication and discretion; legal controls as an aspect of administrative responsibility; relationship of substance and procedure in regulatory action.

157A. American Constitutional Law (4) I, Jacobs
Lecture—1 hour; discussion—3 hours. Prerequisite: courses 5 or 5D or consent of instructor. Judicial review, jurisdiction of the federal courts, interstate and foreign commerce, and taxation.

157B. American Constitutional Law (5) II, Jacobs
Lecture—1 hour; discussion—3 hours. Prerequisite: course 157A. The Bill of Rights of the Federal Constitution Students, either individually or in teams of two members, prepare a written argument in a hypothetical case raising current constitutional issues. In lieu of a standard final examination, an oral defense of his written argument is presented by each student.

***158. American Legal Thought and Institutions** (4) II.
Lecture—4 hours. Prerequisite: course 5 or 5D or consent of instructor. Topics in the development of American legal thought and institutions: reception of the common law; church-state controversies; the role of judge and jury; federalism and individual rights; the natural law and economic regulation; law and the frontier. Offered in odd-numbered years.

159. Judicial Behavior (4) III, Dubois
Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or 5D or consent of instructor. Analysis of the behavior of judges and courts in the political process. Techniques of judicial decision-making. Relationships among courts and other decision-making bodies. Offered in even-numbered years.

160. American Political Parties (4) I, Owens
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) III, Owens
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) II, Owens
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) III, Wade
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) I, Costantini
Lecture—3 hours; discussion—1 hour. The nature of public opinion in America, as it is "supposed to be" and as it is. The distribution of opinions among different publics. Apathy, extremism, and conformity. How children learn about politics.

165. Mass Media and Politics (4) III, Costantini
Lecture—3 hours; discussion—1 hour. The 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. Black Politics** (4) II, Guest lecturers and staff
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division status. A review of the role of black Americans in politics; the rise of black politicians; the civil rights movement; campaign techniques in the urban ghetto.

168. Chicano Politics (4) II, Riddell
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 political environment.

169. Special Studies in Politics (4) I, II, 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.

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, Lieber, Wandesforde-Smith
Lecture—3 hours; discussion—1 hour. 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.

172. Agricultural Policy and Politics (4) III, The Staff
Lecture—3 hours; discussion—1 hour. Examination of the significance of agriculture in American politics. Analysis and interpretation of agricultural policy, including but not limited to price support-production control, environmental impact, farm labor, and relationship to foreign economic policy.

***173. Community Power and Change** (4) I, The Staff
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, Gable
Lecture—3 hours; discussion—1 hour. The legal and political environment of economic controls; techniques of regulating and assisting various sectors of the economy; policy alternatives and administrative processes; the search for the public interest.

***175. Politics Through the Novel** (4) I.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or the equivalent or consent of instructor. A comparative analysis of the use of literature as a means of sociopolitical expression, perception, and portrayal of purposes in political action. European literature, especially British, French and Italian, from the Napoleonic to the present time.

176. Race, Ethnicity and Conflict Management (4) II, Rothchild
Seminar—3 hours; term paper. Prerequisite: consent of instructor. Compares relations between racial, linguistic, cultural, religious or regional groups. Intergroup cleavages and conflicts as well as processes and institutions fostering interaction are analyzed in comparative perspective.

177. Modern Dictatorships (4) III, Groth
Lecture—3 hours; discussion—1 hour. 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) III, Gable
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) I, II, III, The Staff
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, Gable
Lecture—3 hours; special assignments. 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, Marshall
Lecture—3 hours; research assignment. 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) III, Downs
Lecture—3 hours; special assignments. Approaches to 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, Musolf
Lecture—3 hours; discussion—1 hour. The implications for American public administration of evolving concepts about behavior in organizations.

***185. Comparative Administration** (4) III, Gable
Lecture—4 hours. Methodologies, theories, and models of comparison; the setting of administrative systems; structures and functions of administrative systems in developed and developing politics, role of bureaucracy in development and nation-building.

***186. Urban Administration** (4) II, The Staff
Lecture—3 hours; discussion—1 hour. Role of the professional administrator in the urban political and social environment; application of modern management concepts to urban governmental organizations; and examination of persistent and emerging problems and issues.

***187. Administrative Theory** (4) III, Downs
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, Gable
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) II, Gable
Lecture—3 hours; discussion—1 hour. Fiscal role of government in mixed economy and democratic society; politics of revenue and resource allocation; tax policy; intergovernmental financial relations; budget formulation and execution; alternative models of resource allocation; budget as a tool of management.

190. International Relations (4) III, Lieber
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.

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.)

192C. Internship in Public Affairs (2) I, II, III. The Staff (Chairperson in charge)

Prerequisite: courses 192A, 192B (may be taken concurrently); open only to majors in Political Science—Public Service for whom it is required. Supervised internship and study in political, governmental, or related organizations. In addition to performing internship, an extensive paper relating internship to course work will be prepared.

***191. Special Studies in Local Government and Politics** (4) III. Sokolow, Marshall, Riddell

Lecture—3 hours; 1 hour field work. 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.

194HA-194HB-194HC. Special Study for Honors Students (2-3-5) I-II-III. The Staff (Jacobs in charge)

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 course 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

***202. American State and Local Government** (4) III. The Staff
Lecture—2 hours; discussion—2 hours. Prerequisite: courses 100, 101, 103, or consent of instructor. Analysis of American state and local government and politics. Special emphasis on community power structure, federalism, state legislatures, and state administration.

203. American National Government (4) II. Berman
Seminar—4 hours. Survey and analysis of the literature in the field of American Government. Emphasis upon development of methodologies for the study of American Government, and on the development of theories and concepts for understanding the behavior and performance of major national institutions.

205. Field Research in Urban Politics and Policy (4) II. Sokolow, Marshall

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. Environment Public Policy** (4) III. Wandersforde-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) III. Downs
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.

***213. Problems of Classical and Medieval Political Thought** (4) II. Peterman

Seminar—3 hours. Prerequisite: consent of instructor. Concentrated study of the political thought of selected political thinkers of classical and medieval periods.

***215. Basic Problems of Political Theory** (4) I, Zetterbaum
Lecture—3 hours. Prerequisite: 4 units of political theory or consent of instructor. An examination of the fundamental assumptions underlying various approaches to an understanding of politics, emphasizing the scientific or value-free school, the historicist school, and the contributions of analytic philosophy. Offered in even-numbered years.

***218. Political Theory** (4) I, Zetterbaum
Seminar—3 hours.

223. International Relations (4) II. Lieber
Seminar—3 hours.

***224. International Organization** (4) I.
Seminar—3 hours.

***225. The International System** (4) III. Siverson
Seminar—3 hours. 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) II.
Seminar—3 hours.

***240. Democracy and Dictatorship** (4) III. Zinner
Lecture—3 hours. Prerequisite: one upper division course in comparative government, or consent of instructor. Analytical study of differences and similarities in the political process under democratic and dictatorial government. Offered in odd-numbered years.

***241A. Communist Political Systems** (4) I, Zinner
Seminar—3 hours. Prerequisite: course 141 or the equivalent and consent of instructor. Systematic analysis of selected topics dealing with the political process of Communist political systems.

***241B. Communist Political Systems** (4) II. Zinner
Seminar—3 hours. Prerequisite: course 141 or the equivalent and consent of instructor. Systematic analysis of selected topics dealing with the political process of Communist political systems.

242. Seminar in Comparative Politics (4) II, Groth
Seminar—3 hours. Prerequisite: graduate status or consent of instructor. Systematic survey of theories and methods used in the study of Comparative Politics.

***243. Latin American Politics** (4) III.
Seminar—3 hours. Prerequisite: consent of instructor. Intensive study of topic chosen by instructor each year. Normally students will focus on a specific country, although other possible foci include land reform and politics, the U.S. in Latin America, etc. Students conduct research projects related to their interests.

***246. Selected Problems of Transitional Societies** (4) I, Rothchild
Seminar—3 hours.

***247. Western European Government and Politics** (4) II. Groth
Seminar—4 hours. The evolution, politics, and contemporary problems of selected political systems of Western Europe.

***248. Politics of East Asia** (4) III. Kallgren
Seminar—3 hours. Selected contemporary problems of government and international relations in East Asia.

***260. Political Parties** (4) II. The Staff
Seminar—3 hours. Survey of selected topics in American and comparative parties.

261. Political Behavior (4) III. Owens
Seminar—3 hours. Survey of selected topics in political behavior and public opinion.

***270. National and Regional Integration** (4) I, Rothchild
Discussion—3 hours. Prerequisite: one upper division course in comparative government or international relations, or consent of instructor. Examination of the means and motives of regional integration as well as the problems involved in operating and maintaining federations. Classical federal experience and experiments in developing countries will be considered.

***282. Concepts and Problems in Public Administration** (4) I, Gable
Discussion—3 hours. The nature of administrative processes in modern society; analysis of complex organizations; contemporary management practices and processes; and means of controlling bureaucracy. Offered in even-numbered years.

283. Organizational Behavior (4) II. Downs
Seminar—4 hours. Organizational behavior as it relates to public sector decision-making.

286. Administrative Values (4) III. Musolf
Seminar—3 hours. Examination of American administrative values. Offered in odd-numbered 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 Public Law (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of public law.

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.

***291. Seminar in American Constitutional Law** (4) III. Jacobs
Seminar—3 hours. Prerequisite: course 157B or consent of instructor.

***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., including participants in the State and Local Government Internship Program. Deals with the application and evaluation of theoretical concepts through work experience or systematic observation in public and political agencies. May be repeated for credit.

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.)

Pomology

(College of Agricultural and Environmental Sciences)

Noel F. Sommer, Ph.D., Chairperson of the Department

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Faculty

Frank W. Allen, Ph.D., Professor Emeritus
Muriel V. Bradley, Ph.D., Lecturer Emeritus
Royce S. Bringham, Ph.D., Professor
Dillon S. Brown, Ph.D., Professor Emeritus
Robert M. Carlson, Ph.D., Lecturer
Peter B. Catlin, Ph.D., Lecturer
Lawrence L. Claypool, Ph.D., Professor Emeritus
Julian C. Crane, Ph.D., Professor
Luther D. Davis, Ph.D., Professor Emeritus
William H. Griggs, Ph.D., Professor Emeritus
Paul E. Hansche, Ph.D., Professor (*Pomology, Genetics*)

Preforestry; Psychology

Hudson T. Hartmann, Ph.D., Professor Emeritus
Claron O. Hesse, Ph.D., Professor Emeritus
Adel A. Kader, Ph.D., Associate Professor
Dale E. Kester, Ph.D., Professor
Andrew H. Kuniyuki, Ph.D., Assistant Professor
John M. Labavitch, Ph.D., Lecturer
George C. Martin, Ph.D., Lecturer
Warren C. Micki, M.S., Lecturer
F. Gordon Mitchell, M.S., Lecturer
Vito S. Polito, Ph.D., Assistant Professor
E. Louis Proebsting, Ph.D., Professor Emeritus
David E. Ramos, Ph.D., Lecturer
Roger J. Romani, Ph.D., Professor
Kay Ryugo, Ph.D., Professor
Noel F. Sommer, Ph.D., Lecturer
Kiyoto Uriu, Ph.D., Lecturer
Steven A. Weinbaum, Ph.D., Lecturer

Related Major Program. See the major in Plant Science, page 276.

Related Courses. See Plant Science 109, 112, 112L.

Courses in Pomology

Lower Division Courses

3. Citrus and other Subtropical Fruits (3) II. Bringhurst
Lecture—3 hours (including one 3-hour field trip to be arranged). The production of the subtropical fruits including avocados, dates, olives, and citrus with special emphasis on citrus. A study of the fundamental information relating to orchard management as applied to these fruits.

10. Fruit and Nut Crop Production and Utilization (3) I, Martin, Sommer
Lecture—2 hours; discussion—1 hour; one all day Saturday field trip in lieu of discussion last 5 weeks of quarter. Introduction to pomology including: climatic adaptation of deciduous fruits; orchard planning and management; tree nutrition and physiology; fruit development, maturation and harvesting; protecting from cold, quality, storage, transportation and marketing.

92. Internship in Pomology (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor
Work-learn 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

101. Tree Growth and Development (4) II. Crane, Uriu
Lecture—3 hours; laboratory—3 hours. Prerequisite: Botany 2 or Plant Science 102 or consent of instructor. Physiology of fruit plant growth and maintenance; species adaptation; responses to environment and cultural modification (pruning, soil and water management, etc.)

102. Principles of Fruit Production (4) III. Ryugo
Lecture—3 hours; laboratory—3 hours. Prerequisite: Botany 2 or Plant Science 102. The course covers principles underlying cultural practices associated with fruit and nut production, including morphology and physiology of the developing buds, flowers and fruits. The course emphasis is on commercially important temperate zone species.

170A-170B-170C. Applied Pomology (2) I, II, III. Kester, Mitchell, Ramos, Uriu
Lecture—2 hours bi-weekly; two full-day fieldtrips. An overview of production and handling of major pomological crops including a clinical study of important cultural and harvesting activities and problems associated with commercial fruit growing. (P/NP grading only.)

192. Internship in Pomology (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor
Work-learn experience on and/or 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 (Sommer in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Sommer in charge)
(P/NP grading only.)

Graduate Courses

201. Biochemistry and Physiology of Fruits (3) II. Romani
Lecture—3 hours. Prerequisite: Biochemistry 101B; Botany 111B; or consent of instructor. Biochemical and physiolo-

gical phenomena of growth, maturation, ripening, and senescence of fruit. (Open to qualified undergraduates.) Offered in even-numbered years.

203. Physiology of Fruit Plants (3) I, Weinbaum
Lecture—2 hours; discussion—1 hour. Prerequisite: Biochemistry 101A-101B; Botany 111A-111B or Plant Science 102; Pomology 101 and 102 or consent of instructor. Course will consider the physiological bases of developmental phenomena specific and/or characteristic of deciduous perennial fruit plants. Classroom discussions will include interpretation of current research as well as future research approaches. Offered in odd-numbered years.

205. Nutritional Requirements of Deciduous Fruit Crops (4) III. Carlson, Uriu
Lecture—3 hours; laboratory—1 hour; field trips. Prerequisite: Soil Science 109, Botany 111A-111B or Plant Science 102 (or the equivalent). 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 odd-numbered years.

210. Fruit Morphology (4) III. Polito
Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 2. The development of flower, fruit, and seed structures of representative fruit types. Offered in even-numbered years.

212. Postharvest Biology and Biotechnology (3) III. Kader
Lecture—3 hours. Prerequisite: Plant Science 112 or the equivalent. Review of post-harvest biology of fruits and nuts in relation to biotechnological procedures used in handling, emphasizing research needs. Offered in odd-numbered years.

290. Seminar (1) I, II, III. The Staff (Catin in charge)
Seminar—1 hour.

298. Group Study (1-5) I, II, III. The Staff (Sommer in charge)

299. Research (1-12) I, II, III, summer. The Staff (Sommer in charge)
(S/U grading only.)

Portuguese

See Spanish

Preforestry

(College of Agricultural and Environmental Sciences)

Preforestry students who intend to major in either *General Forestry* or *Wood Science and Technology* may be admitted to the School of Forestry and Conservation located on the Berkeley campus, following completion of the sophomore year. The programs offered at Davis provide full preparation for admission to the School. To qualify for such admission, at least 84 quarter units of credit must be completed with a grade-point average of C or higher. In addition, the prescribed preparatory subject matter requirements for the majors must be satisfied. For full details on the majors in General Forestry, Wood Science and Technology, and in the Conservation of Natural Resources please consult the *Announcement of the School of Forestry and Conservation*, which may be obtained from the School of Forestry and Conservation, 145 Mulford Hall, Berkeley 94720. (See also page 108.)

Preforestry Adviser. J. Major (*Botany*); C.C. Delwiche (*Land, Air and Water Resources*).

Psychiatry

See Medicine

Psychology

(College of Letters and Science)

Alan C. Elms, Ph.D., Chairperson of the Department

Department Office, 149 Young Hall (752-1880)

Faculty

Linda P. Acredolo, Ph.D., Assistant Professor
Jarvis R. Bastian, Ph.D., Associate Professor
Leo M. Chalupa, Ph.D., Associate Professor
Richard G. Coss, Ph.D., Associate Professor
William F. Dukes, Ph.D., Professor Emeritus
Alan C. Elms, Ph.D., Professor

Albert A. Harrison, Ph.D., Professor
Kenneth R. Henry, Ph.D., Professor
Neal E.A. Kroll, Ph.D., Professor
Dale F. Lott, Ph.D., Professor (*Wildlife and Fisheries Biology*)

Joseph Lyons, Ph.D., Professor
William A. Mason, Ph.D., Professor
Gary Mitchell, Ph.D., Professor
Robert M. Murphey, Ph.D., Associate Professor
Thomas Natsoulas, Ph.D., Professor
Donald H. Owings, Ph.D., Associate Professor
Karen E. Paige, Ph.D., Associate Professor
Theodore E. Parks, Ph.D., Associate Professor
Stephanie A. Shields, Ph.D., Assistant Professor
Dean K. Simonton, Ph.D., Associate Professor
Robert Sommer, Ph.D., Professor
Charles T. Tart, Ph.D., Professor
Edward D. Turner, Ph.D., Associate Professor

The Major Programs

Psychology is both a science and a form of humanistic inquiry. It provides knowledge about human and animal behavior and constitutes a background for examining your own behavior and that of other people. The UCD Psychology program has several objectives: it presents an introduction to the study of individual and group behavior; it provides a liberal arts major for students looking for employment in business, government, personnel work, or other fields directly after obtaining their bachelor's degree; and it prepares students for graduate study in various areas of psychology, leading to teaching, research, and applied work. (Counseling and other careers in psychology require graduate-level training.)

The Psychology program at UC Davis is extremely broad and represents a wide variety of interests. 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. *Cognitive Psychology* emphasizes how information from the physical world is sensed, perceived and used, and stresses the roles of consciousness, language, and learning in making us what we are.

The Department offers both the Bachelor of Arts degree for the student interested in the liberal arts and the Bachelor of Science program geared for

students with a keen interest in either biology or mathematics. Each program involves an introduction to each of the three areas of psychology. In addition to completing the required core courses, majors may also take specialty courses on topics such as sex differences, aging and maturity, environmental awareness, altered states of consciousness, and primate behavior.

Psychology

A.B. Requirements:

	UNITS
Preparatory Subject Matter	17-21
Psychology 1	4
Statistics 13 or Psychology 41	4
Biological Sciences 1; or a combination of Biological Sciences 10 and one course from Anthropology 1, Physiology 10, Genetics 10	5-8
One course in sociology or cultural anthropology (may be lower or upper division)	4-5
Recommended: both Statistics 13 and Psychology 41.	
Depth Subject Matter	40
Two courses from two of the following three groups and one course from the remaining group	21-24
Group A: Psychology 130, 131, 132, 135	
Group B: Psychology 108, 129, 134, 150	
Group C: Psychology 112, 145, 147, 168	
Additional units to achieve a total of 40 upper division units in psychology	16-19
Total Units for the Major	57-61

Psychology

B.S. Requirements:

Biology Emphasis	UNITS
Preparatory Subject Matter	47-52
Psychology 1	4
Statistics 13	4
Mathematics 16A, 16B; or 11 (or high school equivalent), 21A, 21B	6-10
Physics 10	4
Biological Sciences 1, Physiology 2, Zoology 2, 2L	15
Chemistry 1A, 1B	10
One course in sociology or cultural anthropology (may be lower or upper division)	4-5
Depth Subject Matter	47-50
Seven Psychology courses distributed as specified:	
Group A: two courses from 130, 131, 132, 135	8-9
Group B: three courses from 108, 129, 134, 150	15
Group C: two courses from 112, 145, 147, 168	8
Additional units to achieve a total of 40 upper division units in psychology	8-9
Genetics 100A-100B or 115 or 120	4-6
Zoology 125 or 148	3-4
Total Units for the Major (Biology Emphasis)	94-102

Recommended

Psychology 41, 154, 180B, 180K, and 199 (in a psychological topic); Zoology 105, 106; Anthropology 154, Environmental Studies 110.

Mathematics Emphasis

	UNITS
Preparatory Subject Matter	40-46
Psychology 1	4

Statistics 13	4
Mathematics 11 (or high school equivalent)	0-2
Mathematics 21A, 21B, 21C, 29	15
Chemistry 10	4
Physics 10	4
Biological Sciences 1; or a combination of Biological Sciences 10 and one course from Anthropology 1, Physiology 10, Genetics 10	5-8
One course in sociology or cultural anthropology (may be lower or upper division)	4-5
Recommended: Psychology 41.	
Depth Subject Matter	47-48
Five Psychology courses, distributed as specified:	
Group A: two courses from 130, 131, 432, 135	8-9
Group B: two courses from 108, 129, 134, 150	10
Group C: one course from 112, 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	8-9
One course sequence from Statistics 106-108, 130A-130B, 131A-131B	7-8

Total Units for the Major
(Mathematics Emphasis) **87-94**

Recommended for All Majors

Psychology 103 is strongly recommended for students who plan to do graduate work in a field other than clinical psychology or counseling. Psychology 41 or Statistics 13 must be taken prior to the junior year unless departmental approval is obtained.

Major Advisers. L. P. Acredolo, J. R. Bastian, L. M. Chalupa, R. G. Coss, A. C. Elms, A. A. Harrison, K. R. Henry, N. E. A. Kroll, J. Lyons, W. A. Mason, G. Mitchell, R. M. Murphey, T. Natsoulas, D. H. Owings, K. E. Paige, T. E. Parks, S. A. Shields, D. K. Simonton, R. Sommer, E. D. Turner.

Honors and Honors Program. In order to be eligible for highest honors in Psychology, the student must both meet the college criteria and complete an empirical research project (i.e., experiment or field study) which is written in thesis form and approved by the Department. See pages 97 and 63.

Minor Program Requirements:

	UNITS
Psychology	24
One course from each of the following three groups	13-14
Group A: Psychology 130, 131, 132, 135	
Group B: Psychology 108, 129, 134, 150	
Group C: Psychology 112, 145, 147, 168	
Additional units to achieve a total of 24 upper division units	11-10

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

Lower Division Courses

1. General Psychology (4) I, II, III. The Staff Lecture—4 hours. A general introduction emphasizing empirical approaches with particular focus on the areas of perception and cognition, personality and social psychology, and biological aspects of behavior. Not a prerequisite for Psychology 15 or 16.

15. Introductory Psychobiology (4) I, II, III. The Staff Lecture—4 hours. A survey of genetic, evolutionary and

physiological factors affecting behavior. Using the comparative approach where appropriate, the relevance of biological and biosocial mechanisms to an understanding of people and their interaction with their environment will be emphasized.

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.

41. Research Methods in Psychology (4) I, II, III. The Staff Lecture—4 hours. Introduction to experimental design, interviews, questionnaires, field and observational methods, reliability and statistical inference.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge) By prior arrangement with individual instructor. 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) By prior arrangement with individual instructor. (P/NP grading only.)

Upper Division Courses

103. Advanced Quantitative Description of Behavior (5) I, Turner, Kroll Lecture—5 hours. Prerequisite: Statistics 13 or course 41 or consent of instructor. Summary, inference, and prediction from psychological data, with emphasis on the theoretical aspects.

105. Statistical Inference from Psychological Experiments (4) II. Kroll Lecture—4 hours. Prerequisite: course 103 or consent of instructor. Probability theory, sampling distributions, hypothesis testing, statistical inference, and nonparametric statistics.

108. Physiological Psychology (5) I, II, III. Chalupa, Henry Lecture—4 hours; laboratory—2 hours. Prerequisite: course 1; 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. Acredolo, Mitchell, Coss, Shields Lecture—4 hours. Prerequisite: course 1. An ontogenetic account of human behavior through adolescence with emphasis on motor skills, mental abilities, motivation, and social interaction.

115. Maturity and Aging (4) I, III. Acredolo, Lyons Lecture—4 hours. Prerequisite: course 112. Biological, cognitive, personological, 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) I, Bastian, Murphey Lecture—3 hours; term paper. Prerequisite: course 1; upper division standing; and either Philosophy 21, 22, or 23, or consent of instructor. The historical development of psychological thought and research.

129. Sensory Processes (5) I, II. Henry, Owings Lecture—4 hours; discussion, project, or term paper—1 hour. Prerequisite: course 1 or Zoology 2-2L or consent of instructor. 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 Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 and either Statistics 13 or course 41; 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, Turner, Parks, Bastian Lecture—3 hours; independent library work. Prerequisite: course 1. The cognitive organizations related to measurable physical energy changes mediated through sensory channels. The perception of objects, space, motion, events.

132. Language and Cognition (5) II. Bastian Lecture—5 hours. Prerequisite: course 1, 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. General theories of phyletic differences in learning and motivation drawing upon data from laboratory and

NOTE: For key to footnote symbols, see page 130

field observations. Innate physiological mechanisms, developmental changes, effects of conditioning and other constraints on these processes are examined.

135. Psychology of Consciousness (4) II. Natsoulas
Lecture—4 hours. Prerequisite: course 1. Consideration of major theories of consciousness, with critical examination of relevant experimental, clinical, and field data.

137. Altered States of Consciousness (4) I, III. Tart
Lecture—4 hours. Prerequisite: course 1. 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
Lecture—4 hours. Prerequisite: introductory psychology course. An introduction to current theories and research on emotion and bodily feelings with special reference to self-knowledge.

144. Environmental Awareness (4) I, II, 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. No credit will be given to students who have completed former course 170.

145. Social Psychology (4) I, II, III. Harrison, Simonton
Lecture—4 hours. Prerequisite: course 1. 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) II, III. Elms, Paige
Lecture—4 hours. Prerequisite: course 1. The theories of Freud, Erikson, and other major twentieth-century approaches to personality.

148. Interpersonal Relations (4) II.
Lecture—4 hours. Prerequisite: 16 hours of social science or the equivalent and consent of instructor. Study of interpersonal relationships from both a theoretical-experimental and experiential viewpoint. Social psychological theory, case studies and a small group laboratory within the class provide the basis for class discussion. Limited enrollment.

149. Psychology of Sex Differences (4) I, II. Paige, Mitchell
Lecture—4 hours. Prerequisite: upper division standing and enrollment in one of the following: course 108, 145 or 147. Extensive review of theory and research related to the origin of sex differences in human behavior. The role of physiology, child socialization, and cultural institutions in determining sex differences in personality, cognitive abilities, motivations, and social status.

150. Comparative Psychology (5) I, II, III. Mason, Owings, Mitchell
Lecture—4 hours; discussion or project—1 hour. Prerequisite: courses 1 or 15 or consent of instructor. 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) I, Mitchell
Lecture—4 hours. Prerequisite: course 15 or 150 or an equivalent course in biological sciences; 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.

157. Personality Assessment (4) I.
Lecture—4 hours. Prerequisite: course 41 or Statistics 13. An exploration of the principal methods in psychological assessment of personality, aptitude, and ability, including objective, questionnaire, and projective tests.

159. Social Psychology of Black Americans (5) II. Turner
Lecture—4 hours; discussion—1 hour. Prerequisite: course 145 and Sociology 130, or consent of instructor. Interactions within the black community and between the black community and national institutions from the perspectives of black personality, black culture, and national institutional structure.

165. Introduction to Clinical Psychology (4) I, II, III. Lyons
Lecture—4 hours. Prerequisite: courses 1, 168, and either 112 or 145. Major theoretical formulations in the history of clinical psychology, from classical psychoanalysis to contemporary existentialism and behavior modification. 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. Murphey, Sommer
Lecture—4 hours. Prerequisite: course 1. Descriptive and

functional account of behavioral disorders, with primary considerations given to neurotic and psychotic behavior.

171. Humanistic Psychology (4) II. Tart
Lecture—4 hours. Prerequisite: 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 creativity, self-actualization, and realization of human potential.

177. Psychobiography and Life History (4) III. Elms
Lecture—4 hours. Prerequisite: course 1 or 16 or consent of instructor. 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.

180A-K. Experimental Psychology (4) A, K; I, J, K; II; G, K; III. The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: four upper division psychology courses and consent of instructor. Laboratory investigation of selected problems. Content area will rotate among major fields of psychology from quarter to quarter: (A) General Methodology; (B) Physiological; (C) Developmental; (D) Sensory Processes; (E) Learning; (F) Perception; (G) Psycholinguistics; (H) Motivation; (I) Social; (J) Personality; (K) Comparative. May be repeated for credit when different subject area studied. (Sections B, C, D, E, F, H, and I not offered 1980-81.)

190. Seminar in Psychology (4) III. 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.

192A-192B. Field Work in Psychology (3-3) I, II, III. Harrison
Laboratory—4 hours; term paper. Prerequisite: upper division standing in psychology and consent of instructor. Supervised internship in approved community agency. Credit not applicable toward 36 units of upper division psychology required of majors. (P/NP grading only.)

***197T. Tutoring in Psychology (1-3) I, II, III.** 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. Directed small group study on psychological topics of special interest and relevance to instructor and students. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
By prior arrangement with individual instructor. (P/NP grading only.)

Graduate Courses

200. Current Research Topics in Psychology (1) I. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. A seminar designed to introduce students entering graduate work in the department to its ongoing research activities. (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.)

205. Advanced Statistical Inference from Psychological Experiments (5) II. Kroll
Lecture—4 hours; project and term paper. Prerequisite: graduate 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 (4) III.** Kroll
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.

207. Multivariate Analysis of Psychological Data (4) III. Simonton
Lecture—4 hours. Prerequisite: course 105 or 205 or consent of instructor. The application of multiple regression, factor analysis and related correlational techniques to non-experimental, quasi-experimental, and experimental data.

Techniques implemented using computer multivariate statistical packages.

***208. Physiological Psychology (4) III.** Henry
Seminar—4 hours. Prerequisite: graduate standing in psychology and 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) III. Acredolo, Shields
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. The original behavioral repertoire of the child and its subsequent development.

220. Topics in the History of Psychology (4) II. The Staff
Lecture—2 hours; seminar—2 hours. Prerequisite: graduate standing in Psychology or consent of instructor. A lecture-seminar on selected topics in the history of psychology, and on the applicability of early psychological theory and research to contemporary investigations.

***229. Sensory Processes (4) I.** Chalupa, Henry, Owings
Lecture—2 hours; seminar—2 hours. Prerequisite: graduate standing in Psychology and consent of instructor. A lecture-seminar on selected topics in the fields of sensory psychology and physiology with an emphasis on the biological correlates of sensory processes.

230. Learning (4) I. Parks, Kroll
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theories of learning and memory as applied to the experimental study of simple and complex behavioral processes.

***231. Perception (4) II.** Natsoulas
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Analysis of the role of perception in experience and its effects on behavior.

***245. Social Psychology (4) III.** Harrison
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in social psychology.

***247. Personality (4) II.** Paige
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in human personality.

250. Comparative Psychology (4) I. Mason
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. The study of animal behavior in an evolutionary and comparative framework.

251. Genetic Correlates of Behavior (4) II. Murphey
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and experiment in the genetic determination of animal and human behavior.

252. Seminar in Psychobiology (4) III. Chalupa, Owings
Seminar—4 hours.

263A-263B-263C. Topics in Cognitive Psychology (4) I. Bastian, Kroll, Parks, Lyons
Seminar—4 hours. Selected topics in language processing, memory, perception, problem solving, and thinking, with an emphasis on the common underlying cognitive processes.

***264. Psycholinguistics (4) I.** Bastian
Seminar—4 hours.

265. Psychology of Consciousness (4) II. Natsoulas
Seminar—4 hours. Prerequisite: graduate standing in Psychology or consent of instructor. Theory and research in the psychology of consciousness.

***272. Experimental Study of Personality (4) II.**
Seminar—4 hours.

***273. Environment and Behavior (4) III.** Sommer
Seminar—4 hours. The social psychology of the environment. Research into the use of space and its design implications.

***275. Attitude Formation and Change (4) III.** Elms
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Development of attitudes; theories of attitude change; relationships between attitudes and behavior.

290. Seminar (4) I, III. The Staff
Seminar—4 hours. Prerequisite: 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.

298. Group Study (1-5) II, III. The Staff
(S/U grading only.)

299. Research (2-9) I, II, III. The Staff
(S/U grading only.)

299D. Dissertation Research (1-9) 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-III. Murphey
Seminar—4-2-4. 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.)

Radiological Sciences

(School of Veterinary Medicine)

Timothy R. O'Brien, D.V.M., Ph.D., Chairperson of the Department

Department Office, 1114 Medical Science I (752-0184)

Faculty

- Steven Book, Ph.D., Lecturer (*Laboratory for Energy-Related Health Research*)
- Gerald L. DeNardo, M.D., Professor (*School of Medicine*)
- Gerald L. Fisher, Ph.D., Lecturer (*Laboratory for Energy-Related Health Research*)
- Marvin Goldman, Ph.D., Professor (*Laboratory for Energy-Related Health Research*)
- William J. Hornof, D.V.M., Assistant Professor
- Joe P. Morgan, D.V.M., Vet. med. dr., Professor
- Thomas G. Nyland, D.V.M., Assistant Professor
- Timothy R. O'Brien, D.V.M., Ph.D., Professor
- Otto G. Raabe, Ph.D., Associate Adjunct Professor (*Laboratory for Energy-Related Health Research*)
- Peter F. Suter, Dr. med. vet., Professor
- Jane Turrel, D.V.M., Assistant Professor

Part-Time Clinical Faculty

Sam Silverman, D.V.M., Associate Clinical Professor

Courses in Radiological Sciences

Upper Division Courses

115. Bioenvironmental Consequences of Nuclear Technology (3) III. Goldman
Lecture—2 hours; discussion—1 hour; field trip to Nuclear Power Station. Prerequisite: Physics 2A and Biological Sciences 1 or the equivalent; consent of instructor. Discussion of biospheric implications of radionuclide and thermal effluents generated by nuclear technology. Hazards evaluation based on the predications of the response of the most sensitive physiological systems will be emphasized. (Same course as Environmental Studies 115.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. Radiology Staff (P/NP grading only.)

Graduate Courses

210. Radiography Technic (6) I (extra session). Morgan and staff
Lecture—3 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: a DVM degree. Duties of the radiologic technician are discussed enabling the student to become proficient in the operation of x-ray machines. Position, protocol for diagnostic procedures, film quality and preparation of technic charts are covered. Course begins in late summer. (Deferred S/U grading only, pending completion of course in Fall quarter.)

211. Radiology of the Skeletal System, I (6) I. Morgan and staff
Lecture—3 hours; discussion—2 hours; laboratory—2 hours. Prerequisite: a DVM degree. Course presents information on radiographic diagnosis of pathologic conditions of the appendicular skeleton. Included are diseases of joints, fracture diagnosis and fracture healing, epiphyseal injury, congenital anomalies, developmental disease, bone infection, and malignant disease. Offered in even-numbered years. (S/U grading only.)

212. Radiology of the Abdomen, I (6) II. O'Brien and staff
Lecture—3 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: a DVM degree. Course presents information on radiographic diagnosis of pathologic conditions of the abdomen. Included are diseases of the stomach and intestines. The theory and interpretation of upper and lower GI procedures. cholecystography, splenoportography and abdominal angiography will be discussed. Offered in odd-numbered years. (S/U grading only.)

213. Radiology of the Thorax, I (6) III. Suter and staff
Lecture—3 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: a DVM degree. Course presents information on the normal radiographic anatomy and radiographic diagnosis of pathologic conditions of the lungs, diaphragm, and pleura. The theory and interpretation of pleurography and bronchography will be covered. Offered in odd-numbered years. (S/U grading only.)

214. Radiology of the Skeletal System, II (6) I. Morgan and staff
Lecture—3 hours; discussion—2 hours; laboratory—2 hours. Prerequisite: a DVM degree. Information on the radiographic diagnosis of pathologic conditions of the axial skeleton including degenerative diseases of the intervertebral disc, trauma, infection, and neoplasia is discussed. Theory and interpretation of myelography and cerebral angiography is covered. Offered in odd-numbered years. (S/U grading only.)

215. Radiology of the Abdomen, II (6) II. Nyland and staff
Lecture—3 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: a DVM degree. This course presents information on radiographic diagnosis of pathologic conditions of the abdomen. Included are diseases of kidneys, ureters, urinary bladder, urethra, uterus, and prostate. The theory and interpretation of intravenous pyelography, retrograde cystography and urethrography will be discussed. Offered in even-numbered years. (S/U grading only.)

216. Radiology of the Thorax, II (6) III. Suter and staff
Lecture—3 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: a DVM degree. This course presents information on radiographic diagnosis of congenital and acquired heart diseases and mediastinal diseases. The theory and techniques of cardiac catheterization, lymphangiography, and esophageal studies will be covered. Offered in even-numbered years. (S/U grading only.)

269A-269B. Fundamentals of Radiation Biology (2-2) I-II. Goldman
Lecture—2 hours. Prerequisite: introductory courses in physics, biochemistry and physiology or consent of instructor. Biological effects of radiation including genetic, teratogenic, carcinogenic responses in terms of dose quality and quantity. Included are discussions of dose-effect relationship, radiation therapy, environmental radioactivity, and radiation-protection criteria. Offered in odd-numbered years.

298. Group Study (1-5) I, II, III. Radiology Staff (S/U grading only.)

299. Research (1-12) I, II, III. Radiology Staff (S/U grading only.)

Radiology

See Medicine

Range and Wildlands Science

(College of Agricultural and Environmental Sciences)

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 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.

The field is broad and diverse. Graduates, especially those with some experience, may be employed as consultants, 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. In addition, the training provided by this major should give an excellent background for natural resource management positions.

Job experience, in-service training, and formal education beyond the bachelor's degree may lead to advanced professional positions in research, education, or management.

Range and Wildlands Science

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
Preparatory Subject Matter	44-45
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Physics (Physics 2A or 10)	3
Mathematics (Agricultural Science and Management 150, Mathematics 16A)	7
Economics (Economics 1A or Agricultural Economics 1)	4-5
Production of cultivated plants (Plant Science 2)	4
Depth Subject Matter	66-71
Plant Science 102	4
Physical geography (Geography 1) or geology (Geology 1)	3-4
Meteorology (Atmospheric Science 20 or 105)	3
Soil science and/or water science (Soil Science 2 and two upper division courses from Soil Science and/or Water Science)	8-10
Agronomy 112-112L	3-4
Animal science (Animal Science 2, 118A)	6
Nutrition 103	4
Resource sciences (Resource Sciences 100)	4
Plant ecology (Plant Science 101 or Botany 117)	4
Wildlife ecology (Wildlife and Fisheries Biology 151 or Entomology 104)	3-4
Animal physiology, zoology or botany	6
Range Management (1, 100, 105, 133, 142, 147, 150, 164, 198, 199)	18

NOTE: For key to footnote symbols, see page 130

Breadth Subject Matter	32
English and/or rhetoric	8
Social sciences and humanities electives†	12
Upper division social science courses in at least two of the following: agricultural economics, economics, environmental studies, geography, or political science	12
Unrestricted Electives	32-38
Total Units for the Major	180

Major Adviser. C.A. Raguse (*Agronomy and Range Science*).

Graduate Study. See page 99.

Range Management

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Agronomy and Range Science.

Major Program. See the major Range and Wildlands Science, page 285.

Graduate Study. A program of study is offered leading to the M.S. degree in Range Management. Detailed information can be obtained from the graduate adviser and the *Announcement of the Graduate Division*.

Graduate Adviser. W.A. Williams (*Agronomy and Range Science*).

Related Courses. See Agronomy 112, 112L, Animal Science 118A, Nutrition 103, Resource Sciences 100, Soil Science 105, 120, 121, Wildlife and Fisheries Biology 151.

Courses in Range Management

Questions pertaining to the following courses should be directed to the instructor or to the Academic Advising Center, 122 Hoagland Hall.

Lower Division Course

1. Introduction to Range Management (4) I, Laude
Lecture—3 hours; discussion—1 hour. Basic principles of range management and their relationships to the management of wildlands for livestock production, wildlife, water, recreation, and timber.

92. Range Management Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge)
Lecture—3-36 hours. Prerequisite: consent of instructor. Work-learn 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 Plants (4) I, Crampton
Lecture—2 hours; laboratory—6 hours; two Saturday field trips. Prerequisite: Botany 2. Systematic relationships and identification of range grasses; legumes, forbs, and shrubs; their distribution, environmental requirements, and use.

105. Field Course (2) III, Menke, Crampton
Lecture—10 hours total; laboratory—30 hours total. Prerequisite: consent of instructors. Field studies of range conditions and methods of utilization in various parts of the state. To be given between winter and spring quarters. Considered a spring course for preenrollment.

133. Grassland Ecology (3) II, Raguse
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 even-numbered years.

134. Comparative Ecology of Major Rangeland Systems (4) II, Menke
Lecture—3 hours; one weekend field trip to Nevada; term paper. Prerequisite: course 100 or the equivalent; or consent of instructor. 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.

142. Advanced Range Planning and Management Practices (2) II, Jones
Lecture—2 hours; two Saturday field trips. Prerequisite: course 1 and 100 or consent of instructor. Rangeland use planning and management practices in California grasslands, oak woodlands, chaparral and sagebrush including grazing management, range seeding, fertilization, fire and herbicides; discussion of rangelands as watersheds and multiple-use areas.

***147. Rhizosphere Ecology of Annual Rangelands** (2) III, Phillips
Lecture—2 hours. Prerequisite: Botany 117 or Plant Science 101; Soil Science 2 and Bacteriology 2 recommended. A study of interactions between plant roots and soil microorganisms in annual rangelands with emphasis on the importance of biological nitrogen fixation.

150. Principles of Rangeland Vegetation Measurement, Inventory and Evaluation (4) III, Menke
Lecture—2 hours; laboratory—3 hours; field trip. Prerequisite: course 100, Agricultural Science and Management 150; intended for senior and graduate students. Principles and techniques of sampling grassland and shrubland vegetation cover, frequency, density, and weight. Methods and procedures for inventorying rangeland vegetation resources. Data analysis and evaluation using concepts of range site potential, range condition, range trend, and proper utilization.

164. Multiple Use of Rangelands (3) II, III
Lecture—3 hours; two optional Saturday field trips. Prerequisite: course 1 or 100 and upper division standing. Multiple use of rangelands with emphasis on North America.

192. Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn 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 (Raguse in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Raguse in charge)
Prerequisite: senior standing and consent of instructor. (P/NP grading only.)

Graduate Courses

208. Computer Modeling in Range Management (3) I, Williams
Lecture—1 hour; discussion—1 hour; computer programming and analysis—1 hour. Prerequisite: Agronomy 205B or the equivalent experience. Workshop on use of computer models involving dynamic simulation (DYNAMO and CSMP) and optimization (linear programming) modes using industrial management techniques on range management problems. Modeling philosophy: assumptions, implementation, validation, and experimentation will be emphasized. Offered in odd-numbered years.

290. Seminar in Range Management (1-2) II, Raguse; III, Laude
Seminar—1-2 hours. Topics of current interest in grassland ecology, range and wildlands management, and related modeling and systems analysis.

296. Group Study (1-5) I, II, III. The Staff (Williams in charge)
Selected topics from current world literature in range science.

299. Research (1-12) I, II, III. The Staff (Williams in charge)
Original research involving plant physiology, plant genetics, plant biochemistry, agricultural chemistry, or soil-plant relationships of range and wildlands. (S/U grading only.)

Religious Studies

(College of Letters and Science)

R. David Freedman, Ph.D., Program Director
Program Office, 912 Sproul Hall (752-1219)

Committee in Charge

Paul A. Castelfranco, Ph.D. (*Botany*), Committee Chairperson
Manfred P. Fleischer, Ph.D. (*History*)
R. David Freedman, Ph.D. (*Religious Studies*)
Robert J. Grigg, Ph.D. (*Art*)
Whalen W. Lai, Ph.D. (*Religious Studies*)

Faculty

R. David Freedman, Ph.D., Assistant Professor
Whalen W. Lai, Ph.D., Assistant Professor
Irene Lawrence, Ph.D. Lecturer
Marian B. Ury, Ph.D., Associate Professor
(*Religious Studies; Comparative Literature*)

The Major Program

The Religious Studies major is designed to give the student an understanding of religion in its manifold complexity. The study of religion must consider a vast number of elements, in particular: (1) the message of the great historical religions; (2) the thought of the main theological and philosophical spokesmen for these traditions; (3) the contribution of great literary authors having religious significance; (4) the approach of the social sciences to the study of religious phenomena; (5) the history of religious thought and institutions and the political and social history of those periods in which religious questions have played a prominent role; and (6) the expression of religious beliefs through music and the arts.

Religious Studies

A.B. Requirements:

	UNITS
Preparatory Subject Matter	24
History 4A, 4B, 9A	12
Philosophy 21	4
Religious Studies 4A, 4B	8
Depth Subject Matter	40-42
Religious Studies 193	4-6
A consistent program of at least 36 upper division units dealing with various aspects of religious study, including:	36
(a) one course with a theological, philosophical or literary orientation (e.g., Religious Studies 140, Philosophy 105, English 171)	
(b) one historical course (e.g., History 102A, 131B, Religious Studies 110)	
(c) one course which exemplifies the approach of the social sciences to religious phenomena (e.g., Anthropology 124, Sociology 146)	
Total Units for the Major	64-66

Recommended

American Studies 1B; Anthropology 2; Classics 10, 41; Integrated Studies 2B; Philosophy 1. A reading knowledge of a foreign language is highly recommended. Consult major adviser for a complete list of recommended upper division courses.

Major Advisers. R. D. Freedman, W. W. Lai

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.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

	UNITS
Religious Studies	20
Five courses chosen from Religious Studies 102, 110, 122, 124, 140, 168, 172	20
Oriental Religions	20
Religious Studies 70, 168, 172; and two courses from Religious Studies 110, History 191A, 194A	20
Judaism	20
Religious Studies 23, 122, 124	12
Two additional courses from Religious Studies 110, History 143A, 144C	8
(Religious Studies 122 and 124 may be repeated for credit in a different subject area, and the second election can replace one of the above three courses.)	
Christian Studies	20
Religious Studies 40, 102, 140, and two courses from Religious Studies 110, Philosophy 145, History 130A, 130B, 130C, 131B	20

Courses in Hebrew

1. Elementary Modern Hebrew (5) I. The Staff (Chairperson in charge)
Recitation—4 hours; laboratory—2 hours. Introduction to modern written and spoken Hebrew. (Students who have successfully completed 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 option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1AT. Individualized Elementary Hebrew (5) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour; laboratory—8 hours. Introduction to modern written and spoken Hebrew. Parallels material of course 1. Individualized instruction by videotape. (Students who have successfully completed 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 option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Modern Hebrew (5) II. The Staff (Chairperson in charge)
Recitation—4 hours; laboratory—2 hours. Prerequisite: course 1 or 1AT. Introduction to modern written and spoken Hebrew. Continuation of course 1.

2AT. Individualized Elementary Hebrew (5) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour; laboratory—8 hours. Prerequisite: course 1 or 1AT or consent of instructor. Introduction to modern written and spoken Hebrew. Parallels material of course 2. Individualized instruction by videotape.

3. Elementary Modern Hebrew (5) III. The Staff (Chairperson in charge)
Recitation—4 hours; laboratory—2 hours. Prerequisite: course 2 or 2AT. Introduction to modern written and spoken Hebrew. Continuation of course 2.

***4. Intermediate Modern Hebrew (4) I.** Freedman
Lecture—1 hour; discussion—3 hours. Prerequisite: course 3 or the equivalent. Review of grammatical principles by means of discussion of written exercises; readings of modern texts.

***5. Intermediate Modern Hebrew (4) II.** Freedman
Lecture—1 hour; discussion—3 hours. Prerequisite: course 4. Review of grammatical principles by means of discussion of written exercises; readings of modern texts. Readings will reflect Hebrew literature from the Enlightenment to the present. Authors represented will include: Bialik, Tschernikhovski, Ahad Ha'am and Agnon.

***35A-35B. Introduction to Biblical Hebrew (4-4) I-II.** The Staff (Chairperson in charge)
Lecture—2 hours; discussion—2 hours. The grammar and syntax of Biblical Hebrew with the goal of reading Biblical prose.

Courses in Religious Studies

Lower Division Courses

4A. World Religions (4) I, Lai
Lecture—3 hours; discussion—1 hour. Eastern religions, including Hinduism, Buddhism and Taoism from their origins to the present.

4B. World Religions (4) II. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Western religions including ancient Near-Eastern and Mediterranean religions, Judaism, Christianity, Islam, selected aspects of contemporary Western religious life.

10. Introduction to Religious Studies (2) I, II, III. The Staff (Chairperson in charge)
Lecture—2 hours. A 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. Biblical Religion (4) I. Freedman
Lecture-discussion—4 hours. The religion of Israel from Abraham to the rebuilding of the Temple in post-exilic time. Emphasis will be on themes: Covenant, Law, Prophecy, and Wisdom.

23. Basic Judaism (4) II. Freedman
Lecture-discussion—4 hours. A general overview of the traditional laws and customs of Judaism, with an introduction to the history, ethics, and underlying beliefs of Judaism. Course requires no prior knowledge of Judaism.

40. New Testament (4) III. Lawrence
Lecture—3 hours; discussion—1 hour. New Testament literature from critical, historical and theological perspectives.

60. Introduction to Islam (4) II. The Staff
Lecture—4 hours. Basic beliefs and institutions of Islam. Topics include: Muhammad and the Qur'an; Islamic law, theology, and mysticism; relationship to Judaism and Christianity; Islamic sects; position of women; Islam and politics. Offered in even-numbered years.

70. Introduction to Buddhism (4) III. Lai
Lecture—3 hours; term paper. Prerequisite: course 4A recommended. Lectures, readings, and discussions on the development of Buddhism in India, China, and Japan; its influence on various Far Eastern art forms.

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)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Study of Religion: Issues and Methods (4) III. The Staff (Chairperson in charge)
Lecture-discussion—3 hours; term paper. The principal issues and methods of Religious Studies and associated fields.

***102. Christian Origins (4) I.** Lawrence
Lecture-discussion—3 hours; term paper. Prerequisite: course 40; course 23 recommended. The beginning of the Christian faith seen in relation to milieu in which it originated. Offered in odd-numbered years.

***110. Religious Biographies (4) II.** The Staff (Chairperson in charge)
Lecture-discussion—3 hours; term paper. The lives of selected religious leaders representative of different religious temperaments and historical traditions.

***122. Studies in Biblical Texts (4) III.** Freedman
Lecture—3 hours; term paper. Prerequisite: course 21. Study of a book from the Prophets or Writings from critical, historical, and religious perspectives.

***124. Topics in Judaism (4) III.** Freedman
Lecture-discussion—3 hours; term paper. Prerequisite: course 23. Examination of selected aspects of Jewish life, religion, or literature.

125A-125B-125C. Talmud: Zeraim (2-2-2) I-II-III. Freedman Seminar—2 hours. Prerequisite: course 23; reading knowledge of Hebrew helpful. Examination of texts from the Talmudic order Zeraim (agricultural) from critical, historical, and religious perspectives. (P/NP grading only.)

126A-126B-126C. Talmud: Moed (2-2-2) I-II-III. Freedman Seminar—2 hours. Prerequisite: course 23; reading knowledge of Hebrew helpful. Examination of texts from the Talmudic order Moed (festivals) from critical, historical, and religious perspectives. (P/NP grading only.)

127A-127B-127C. Talmud: Nashim (2-2-2) I-II-III. Freedman Seminar—2 hours. Prerequisite: course 23; reading knowledge of Hebrew helpful. Examination of texts from the Talmudic order Nashim (women) from critical, historical, and religious perspectives. (P/NP grading only.)

128A-128B-128C. Talmud: Neziqin (2-2-2) I-II-III. Freedman Seminar—2 hours. Prerequisite: course 23; reading knowledge of Hebrew helpful. Examination of texts from the Talmudic order Neziqin (torts) from critical, historical, and religious perspectives. (P/NP grading only.)

129A-129B-129C. Talmud: Qodashin (2-2-2) I-II-III. Freedman Seminar—2 hours. Prerequisite: course 23; reading knowledge of Hebrew helpful. Examination of texts from the Talmudic order Qodashin (sacrifices) from critical, historical, and religious perspectives. (P/NP grading only.)

130A-130B-130C. Talmud: Tohorot (2-2-2) I-II-III. Freedman Seminar—2 hours. Prerequisite: course 23; reading knowledge of Hebrew helpful. Examination of texts from the Talmudic order Tohorot (purity) from critical, historical, and religious perspectives. (P/NP grading only.)

140. Christian Theology (4) I. The Staff (Chairperson in charge)
Lecture—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.

***168. Religions of India (4) I, Lai**
Lecture—3 hours; term paper. Prerequisite: courses 4A and 10 recommended. The religions of India focusing primarily on Hinduism from Vedic to premodern times and on Buddhism.

172. Ch'an (Zen) Buddhism (4) I, Lai
Lecture-discussion—3 hours; term paper. Prerequisite: course 4A 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.

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.

***193. Proseminar (4-6) I, II, III.** The Staff (Chairperson in charge)
Supervised research—12-18 hours. Prerequisite: open only to seniors majoring in Religious Studies. Preparation of senior thesis on topic selected by the student with approval of Religious Studies curriculum committee. (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.)

Renewable Natural Resources

(College of Agricultural and Environmental Sciences)

The Major Program

The Renewable Natural Resources major is a program of 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. Students who choose this major include those (1) interested in careers associated with resource utilization and management, (2) interested in pursuing post-baccalaureate and academic or professional training, or (3) contemplating a natural resources-related career but uncertain regarding the selection of a specific major.

Reproduction; Resource Sciences

The curriculum for this major provides flexibility in meeting individual needs, interests, and objectives. But, at the same time, it requires certain courses in the basic physical and biological sciences, and in the subject matter area. An upper division general resource sciences course, a resource economics course, and a specified number of units of resource-oriented courses are required of all majors. The resource-oriented courses, to be selected with the approval of the adviser, should for most students involve mainly one renewable resource, but for some students, such as those preparing for a teaching credential or science communication, for example, course work dealing with several resources may be preferable. In addition, supportive courses to acquire additional knowledge and skills are specified.

Positions now held by Renewable Natural Resources graduates are quite varied, but many are employed as resource analysts and planners as well as technical staff specialists with government agencies, municipalities and private firms. A significant number of graduates have undertaken further studies leading to advanced degrees in renewable natural resources.

Renewable Natural Resources

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
Preparatory Subject Matter	73
English or English and rhetoric (see college requirements, page 70)	8
Chemistry (Chemistry 1A, 1B)	10
Physics (Physics 2A, 2B, 3A, 3B)	8
Mathematics and statistics (Mathematics 16A, Statistics 13, and computer science)	10
Biology (Biological Sciences 1)	5
Animal and/or plant science	6
Soil and/or water science	6
Atmospheric science (Atmospheric Science 20)	3
Geology or physical geography	3
Additional courses in biological/physical sciences and mathematics, to be selected with adviser's approval (e.g., Botany 2, Zoology 2, Chemistry 8A, 8B, Mathematics 16B, Physics 2C)	14
Depth Subject Matter	47
Resource Sciences 100	4
Agricultural Economics 147, 148	3
Resource-oriented courses selected with adviser's approval	24
Supportive courses:	
Written expression (in addition to College requirement)	3
Quantitative skills (e.g., Agricultural Science and Management 150, Environmental Studies 123 Statistics 106)	4
Social-political awareness in resource sciences (e.g., Environmental Studies 160, 161; Environmental Toxicology 138, Geography 161, Geology 134, Water Science 150, Wildlife and Fisheries Biology 151)	3
Plant or animal ecology (e.g., Botany 117, Entomology 104, Environmental Studies 100, Plant Science 101 Zoology 125)	3
Special study or internship (Resource Sciences 190, 192, 198, 199)	3

Breadth Subject Matter	21
Social sciences and humanities electives†	12
At least one upper division course from three of the following areas:	9
Agricultural economics or economics, agronomy, animal science, atmospheric science, botany, civil or agricultural engineering, environmental horticulture, environmental planning and management, environmental studies, environmental toxicology, geography, geology, plant sciences, range management, resource sciences, soil science, water science, wildlife and fisheries biology, zoology, or others with adviser's approval.	

Electives

Total Units for the Major **180**

Major Adviser. V. V. Rendig (*Land, Air and Water Resources*), 752-6215/1406.

Information Center for the major is located at 122 Hoagland Hall, Resource Sciences Teaching Center, 752-1669.

Graduate Study. See page 99.

Reproduction

(School of Veterinary Medicine)

John P. Hughes, D.V.M., Chairperson of the
Department
Department Office, 1126 Medical Science I
(752-1358)

Faculty

Donald L. Bath, Ph.D., Lecturer
Domenico Bernoco, D.V.M., Libera Docenza,
Associate Professor
Robert H. Bon Durant, D.V.M., Assistant
Professor
Ann Trommershausen Bowling, Ph.D., Lecturer
Edward C. Feldman, D.V.M., Assistant Professor
John P. Hughes, D.V.M., Professor
John W. Kendrick, D.V.M., Ph.D., Professor
Irwin K. M. Liu, D.V.M., Ph.D., Assistant
Professor
George H. Stabenfeldt, D.V.M., Ph.D., Professor
Clyde Stormont, Jr., Ph.D., Professor

Part-Time Clinical Faculty

Paul E. Blackmer, D.V.M., Assistant Clinical
Professor
Robert E. Dickerson, D.V.M., Associate Clinical
Professor
Robert J. Harris, D.V.M., Associate Clinical
Professor
James R. Howard, D.V.M., Ph.D., Associate
Clinical Professor
Gerald R. Mitchell, D.V.M., Associate Clinical
Professor
Frank A. Mongini, D.V.M., Assistant Clinical
Professor
Jack W. Morse, D.V.M., Associate Clinical
Professor

Courses in Reproduction

Upper Division Courses

111. Immunogenetic and Electrophoretic Techniques (2) I, Stormont
Lecture—1 hour; laboratory—3 hours. Prerequisite: Animal Genetics 107 (may be taken concurrently) or consent of

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

instructor. Immunologic and electrophoretic techniques used in the exploration of heritable differences in red cell antigens, serum proteins and enzymes of domestic animals.

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Hughes in charge)
(P/NP grading only.)

Graduate Courses

231. Pathophysiology of Mammalian Reproductive Processes (3) III. Stabenfeldt
Lecture—3 hours. Prerequisite: senior standing in the 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 odd-numbered years.

234. Applied Dairy Cattle Nutrition (2) II. Bath
Lecture—2 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Application of basic nutritional principles to practical dairy cattle feeding and use of computers to formulate rations based on optimum nutritional and economic value. Lectures supplemented with visits to dairy farms to evaluate feeding programs.

***290. Seminar** (1) I, II, III. The Staff (Kendrick in charge)

292. Current Topics in Reproduction (1) I, II, III. The Staff (Stabenfeldt in charge)
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 (Hughes in charge)

299. (1-12) I, II, III. The Staff
(S/U grading only.)

Professional Courses

424. Theriogenology of Farm Animals (1 ½ per week) I, II, III. The Staff (Kendrick and Hughes in charge)
Seminar-laboratory—50 hours. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, graduate students, or consent of instructor. Emphasis placed on preventive medicine aspects of reproduction in the horse and cow. Opportunity given for in-depth study of individual animal disease problems. Seminar participation required. May be repeated for credit. (S/U grading only.)

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.

Related Major Program. See the major in Renewable Natural Resources, this page.

Related Courses. See courses in Agricultural Economics, Atmospheric Science, Civil Engineering, Environmental Planning and Management, Environmental Studies, Geography, Range Management, Soil Science, Water Science, and Wildlife and Fisheries Biology.

Courses in Resource Sciences

Questions pertaining to the following courses should be directed to the instructor or to the Resource Sciences Teaching Center, 122 Hoagland Hall (752-1669).

Lower Division Courses

2. Concepts in Forestry (2) II. Delwiche.
Lecture—2 hours. An introduction to the concepts of for-

estry as illustrated by current issues in the western United States.

10. Natural Resources of California (2) III. Walker
Lecture—2 hours. Study of the natural resources of California; topographical influences on climate and resource characteristics; resource interrelationships; the social and economic implications of resource utilization for agriculture, recreation, and urban development.

12. Aerial Study of Natural Resources of California (2) III. Walker
Discussion—2 hours; one Saturday flight. Prerequisite: course 10 (may be taken concurrently) or consent of instructor. Group study of natural resources of California with emphasis directed to resource character and utilization potential. Mid-quarter study of topics via a "flying classroom" enhances a unique learning experience. (Flight fee approximately \$50.) Limited enrollment. (P/NP grading only.)

92. Resource Sciences Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn experience off and on campus in resource sciences. Internship supervised by a member of the faculty. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Department Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100. Concepts in Renewable Natural Resources (4) II. Snyder, Walker
Lecture—3 hours; discussion—1 hour. Prerequisite: junior standing or consent of instructor. A survey of renewable natural resources, including relationships among soil, water, air, energy, plants, animals and society. Role of man in resource management, preservation and improvement for provision of food, fiber, environmental enhancement and recreation.

101. Agriculture and Wildlife (3) II. Crampton
Lecture—3 hours; two Saturday field trips. Prerequisite: upper division standing or consent of instructor. Study of the Central California Valley and the Delta region as an example of utilization for production, agriculture, and outdoor recreation—the conflicts and harmonies; lectures by distinguished biologists of the University, and the State Department of Fish and Game.

103. Solar Energy Applications (3) I, Flocchini
Lecture—3 hours. Prerequisite: Mathematics 16B and Atmospheric Science 20. 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.

110. Wildflowers of the Central Valley of California (3) III. Crampton
Lecture—3 hours. Prerequisite: Botany 2. Study of the resident plants in and about the Central Valley of California; growth forms, plant communities; identification and systematic relationships, field collections; land use and overall influence on wildflower habitats.

***118. Mineral Elements in Food Chains** (2) II. Burau, Epstein, Rendig
Lecture—2 hours. Prerequisite: Chemistry 1B, and one course each in biological science and earth science or consent of instructor. Sources of mineral nutrients, their progression through food chains, and their importance in plants, animals and human life support systems; effects of man's activities on mineral nutrient cycling and utilization. Guest lecturers for some topics. (Same course as Environmental Studies 118.)

190. Seminar on Alternatives in Agriculture (2) II. The Staff (Department Chairperson in charge)
Seminar—2 hours. Seminar on alternative points of view regarding agronomic, economic and public policy aspects of current and future agricultural systems. (P/NP grading only.)

192. Resource Sciences Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn 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 (Department Chairperson in charge) (P/NP grading only.)

Graduate Course

203. Solar Energy Conversion Processes (3) II. Flocchini
Lecture—3 hours. Prerequisite: course 103, Mathematics 16C. Forms of solar energy; solar energy climatology; heat transfer; analysis of systems for space heating and cooling.

Rhetoric

(College of Letters and Science)

James J. Murphy, Ph.D., Chairperson of the Department
Department Office, 224 AOB-IV (752-1221)

Faculty

- Gary L. Cronkhite, Ph.D., Professor
- Michael A. DeSousa, M.A., Lecturer
- Robert C. Johnson, Ph.D., Lecturer
- Jan W. Kelly, M.A., Lecturer
- Michael C. Leff, Ph.D., Associate Professor
- Martin J. Medhurst, Ph.D., Assistant Professor
- Gerald P. Mohrmann, Ph.D., Professor
- James J. Murphy, Ph.D., Professor
- Ralph S. Pomeroy, Ph.D., Associate Professor
- Susan B. Shimanoff, Ph.D., Assistant Professor
- Bonnie M. Spillman, Ph.D., Lecturer
- Michael J. Sunnafrank, Ph.D., Assistant Professor
- John L. Vohs, M.A., Lecturer

The Major Program

The Department of Rhetoric offers a wide range of courses for credit leading to a bachelor's degree. The study of human communication is approached from two broad and complementary perspectives—both humanistic and social scientific methods of study are represented by active scholars.

Rhetoric

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	8
Rhetoric 1, 3	8
Depth Subject Matter	38
Rhetoric 110, 114, 120, 153	16
One course from each of the following three groups	12
(a) Rhetoric 111, 112, 113	4
(b) Rhetoric 121, 122, 123	4
(c) Rhetoric 130, 141	4
Rhetoric 190, 191	6
Additional upper division units in rhetoric to achieve a total of 38	4
Total Units for the Major	46

Major Advisers. G.L. Cronkhite, M. C. Leff, M.J. Medhurst, G.P. Mohrmann, J.J. Murphy, R.S. Pomeroy, S.B. Shimanoff, M.J. Sunnafrank, J.L. Vohs.

Minor Program Requirements:

There are four study emphases offered through the minor program in Rhetoric.

	UNITS
Rhetoric	20-22
<i>General Emphasis</i>	20
Rhetoric 110, 113, or 120	4
Rhetoric 114, 130, or 140	4
A coherent sequence of three additional upper division units in rhetoric with approval of the minor adviser	12
Recommended preparation: units from Rhetoric 1, 3, 10, 51.	

Theory and Criticism Emphasis

Rhetoric 114; 110 or 113; and one course from Rhetoric 120, 121, 122, or 123

Two additional courses from the Rhetoric 110 or 120 series

Recommended preparation: Rhetoric 1, 51.

Contemporary Communication Studies Emphasis

Rhetoric 113; 114 or 105; 153 or 141

Two additional courses from Rhetoric 105, 114, 122, 123, 130, 134, 140, 141

Recommended preparation: units from Rhetoric 3, 10, 42.

Communication Skills Emphasis

Rhetoric 51 or 42

Rhetoric 151, 190; 130 or 134; and one course from Rhetoric 121, 122, or 123

One additional course from Rhetoric 110, 120, or 130 series

Recommended preparation
Rhetoric 1, 3.

Minor Adviser. Contact Departmental Office.

Graduate Study. The Department of Rhetoric offers programs of study and research leading to the M.A. degree in Rhetoric. Detailed information may be obtained from the Graduate Adviser, Department of Rhetoric.

Graduate Adviser. See *Class Schedule and Room Directory*.

Courses in Rhetoric

Lower Division Courses

1. Introduction to Public Speaking (4) I, II, III. The Staff
Lecture—4 hours. Practice in the preparation and delivery of speeches with an introduction to rhetorical theory and criticism as applied to public address.

***2. Oral Interpretation** (4) III. The Staff
Lecture—4 hours. Theory and practice in the oral reading of literature.

3. Group Communication (4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. Study of the rhetorical process in informal situations. Topics include interaction, leadership techniques, and decision making in groups. (P/NP grading only.)

10. Introduction to Communication Studies (3) II, III. Mohrmann
Lecture—3 hours. Introduction to the nature and function of human communication, special reference to messages, sending, receiving, and channels.

42. Rhetoric in the News Media (4) II. Pomeroy
Lecture—2 hours; discussion—2 hours. Study of rhetorical concepts and processes influencing the news function of television, radio, newspapers, and mass circulation periodicals. Discussions, lectures, and group projects on problems of media bias, objective reporting, feature writing, and editorial responsibility. Critical analysis of journalistic styles.

51. Introduction to Advocacy (4) I, II, III. Leff
Lecture—4 hours. Introduction to the rhetoric of controversy, with emphasis upon the nature of public debate, the analysis of issues, and the logical presentation of evidence in support of arguments.

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. Analysis of Message Systems (4) I, Vohs
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) II. Cronkhite
Lecture—4 hours. 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. Classical Rhetorical Theory (4) I, III. Murphy
Lecture—4 hours. Origins of Greek and Roman rhetorical theory, with emphasis upon the contributions of Isocrates, Plato, Aristotle, Cicero, and Quintilian.

NOTE: For key to footnote symbols, see page 130

111. Medieval and Renaissance Rhetorical Theory (4) II. Murphy
Lecture—2 hours; discussion—2 hours. Development of the European rhetorical tradition from Saint Augustine to A.D. 1700. Attention to the three medieval rhetorical genres, the medieval university, the impact of printing, changes in Renaissance concepts of knowledge as they affected rhetoric.

112. Early Modern Rhetorical Theory (4) II. Pomeroy
Lecture—4 hours. English and continental theories of rhetoric to 1900, with reference to developments in psychology, philosophy, and belles-lettres. Emphasis upon the works of Ward, Priestley, Campbell, Blair, and Whately.

113. Current Humanistic Trends in Rhetorical Theory (4) III. Leff
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) I, Cronkrite
Lecture—3 hours; discussion—1 hour. Rhetoric as a social science, characteristics of social theories, components of theories, development and testing of hypothesis, general models, theories, and research.

120. Rhetorical Criticism (4) I, Mohrmann
Lecture—4 hours. Survey of critical methods and their use in the interpretation of rhetorical discourse.

121. Public Address in Western Culture (4) I.
Lecture—3 hours; discussion—1 hour. 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. Rhetoric in Social Controversy (4) III.
Lecture—3 hours; discussion—1 hour. Case studies of rhetoric in social, political, and economic protest embodied in selected social movements. Examination of rhetorical dilemmas of social movements; rhetorical strategies and tactics, including extra-discursive means of persuasion, and the nature and effects of establishment response.

123. The Persuasive Campaign (4) I.
Lecture—4 hours; class project. Study of selected political and nonpolitical campaigns, illustrating prolonged organized efforts to change, maintain, or deter designated behaviors in a given audience through the use of a variety of media and influences.

130. Group Communication Processes (4) III. 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, Vohs
Lecture—4 hours. Prerequisite: course 1, 3, or 10, or the equivalent. Communication between 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.

140. Mass Communication and the Public (4) II.
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.
Lecture—4 hours. Prerequisite: course 153, 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) III. 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) III. 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 print media, as examined by a practicing professional.

151. Methods of Advocacy (4) I, Pomeroy
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.

153. Empirical Studies in Rhetoric (4) II. Vohs
Lecture—4 hours. Prerequisite: consent of instructor. Consideration of contributions derived from sociometric and psychometric approaches to analysis of rhetorical process.

180. Current Topics in Rhetoric (4) I, II, III. The Staff
Seminar—4 hours. Prerequisite: upper division standing with a major in Rhetoric or consent of instructor. Group study of a special topic in Rhetoric. May be repeated once for credit. Enrollment limited.

190. Rhetorical Research (2) I, II. Murphy
Lecture—2 hours; laboratory—1 hour; term paper. Prerequisite: junior standing and declared major in Rhetoric, or consent of instructor. Required for majors in Rhetoric. Methods of reporting research into various aspects of human communication. Weekly assignments in organization and writing of research reports.

191. Senior Proseminar (4) II, III. The Staff
Lecture—3 hours; seminar—1 hour. Prerequisite: course 190. Individual research on a rhetorical topic approved by a faculty committee.

192. Internship in Rhetoric (3-5) I, II, III. The Staff
Laboratory—3-5 hours. Prerequisite: 12 upper division units in rhetoric and consent of instructor. Work-research projects at off-campus sites under departmental supervision. (P/NP grading only.)

197T. Tutoring in Rhetoric (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 consent of Department Chairperson. Tutoring in undergraduate rhetoric 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.

200. Research in Rhetoric and Communication (4) I. The Staff (Murphy in charge)
Lecture—4 hours. Survey of traditional and current approaches to the study of communication; special attention to bibliography and methodology, with sample research projects.

201. Empirical Methods in Communication (3) III. Cronkrite
Seminar—3 hours. Prerequisite: courses 153 or the equivalent or consent of instructor; upper division or graduate standing. Methods and techniques of empirical communication research; epistemological assumptions, requirements of research questions, measuring communication variables, techniques of research design, statistical analysis.

202. Critical Methods (3) II. Mohrmann
Individual consultation—1 hour. Prerequisite: course 120 or the equivalent. Theory and method in rhetorical criticism since Aristotle; individual critical projects.

260. Message Analysis: Argumentation, Persuasion, and Opinion Change (3) I, Cronkrite, Leff
Seminar—3 hours. Prerequisite: course in rhetorical theory and course 114 or the equivalent or consent of instructor. Survey of theories of argumentation, persuasion, and opinion change in classical, renaissance, early modern and contemporary literature of rhetorical and communication theory.

261. Message Analysis: Language and Style (3) III. Leff
Seminar—3 hours. Prerequisite: course 105, 120, or the equivalent. Study of the persuasive effects of the diction and syntax used in messages. Attention to both classical and contemporary theory.

262. Message Analysis: Structure (3) II. Leff
Seminar—3 hours. Prerequisite: courses 110, 114, 120 or the equivalent. Study of the persuasive effect of the structure and organization of messages. Attention devoted both to traditional theories of disposition and to modern empirical studies of order effects. Consideration of the relationship between formal and aesthetic aspects of structure and persuasive effect.

290. Seminar (1-4) III. The Staff (Pomeroy in charge)
Seminar—1-4 hours. Selected topics in rhetoric and communication.

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.)

Russian

(College of Letters and Science)

Department Office (German and Russian), 416
Sproul Hall (752-2114)

Faculty

Virginia H. Bennett, Ph.D., Assistant Professor
*C. James Gallant III, Ph.D., Assistant Professor
Lawrence J. Grant, M.A., Lecturer
Daniel Laferrière, Ph.D., Assistant Professor
Valerie A. Tumins, Ph.D., Professor

The Major Program

The Department offers a major in which a student may elect to complete one of two emphases, depending upon anticipated career interest. The common basis for both programs is extensive training in the Russian language. The traditional major, the *Russian Literature* emphasis, concentrates on the evaluation of the literary movements and cultural trends that have expressed and shaped Russian national consciousness. This program prepares the student for graduate study in literature and a career in teaching. The second program, the *Russian Language* emphasis, focuses on linguistics and practical language skills. This program prepares the student for graduate study and, in conjunction with a secondary field of study, such as social or natural science, can lead to careers in government or business.

Russian

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	8-38
Russian 1 through 6 (or the equivalent)	0-30
Russian 41, 42	8
Depth Subject Matter	36
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
Total Units for the Major	44-74

Major Adviser. L.J. Grant.

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 page 97.

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 Language	20
Russian 6	4
Russian 101A, 101B, 101C	12
One course from Russian 102, 103, 104, 105, 160	4
Russian Literature	20
Russian 41 or 42	4
Russian 121, 123, and 140 or 141	12
One course from Russian 120, 126, 150, 154	4

Teaching Credential Subject Representative. C.J. Gallant. See page 105 for the 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.

Graduate Adviser. C.J. Gallant.

Courses in Russian**Lower Division Courses**

Course Placement. 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 (6) I, II, III. Grant and staff
Recitation—5 hours; language laboratory—1 hour. Elementary Russian grammar and conversation. (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.)

1ATA-1ATB-1ATC. Individualized Russian (2-2-2) I-II-III. Grant

The three segments of course 1AT correspond to course 1. Student-instructor contact consists of individual tutoring and testing periods. Students may start at any time and complete one or more two-unit segments in a given quarter (Students who have successfully completed the second or more advanced year of high school level work in Russian 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.)

1SC. Intensive Scientific Russian (6) I, II, III. Gallant and staff
Discussion—5 hours; consultation with instructor—1 hour. A comprehensive survey of Russian grammar with extensive reading exercises designed to prepare the scientist to read texts of moderate difficulty within one quarter. Requires no prior knowledge of Russian. (Students who have had course 1SCI may not receive credit for this course.)

1SCI. Individualized Scientific Russian (6) I, II, III. Gallant and staff
Individual tutorials with faculty. Students work at their own pace and may arrange their lessons according to their own schedules. Students must meet with a tutor once a week and must complete all work within three consecutive quarters. (Deferred grading only pending completion of course.) (Students who have had course 1SC may not receive credit for this course.)

2. Elementary Russian (6) I, II, III. Grant and staff
Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 1. Elementary grammar, reading and conversation.

2ATA-2ATB-2ATC. Individualized Russian (2-2-2) I-II-III. Grant

The three segments of course 2AT correspond to course 2. Student-instructor contact consists of individual tutoring and testing periods. Students may start at any time and complete one or more two-unit segments in a given quarter.

3. Elementary Russian (6) I, II, III. Grant and staff
Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 2. Elementary grammar, reading, conversation and composition.

4. Intermediate Russian (4) I, Grant and staff
Discussion—4 hours; laboratory—1 hour. Prerequisite: course 3. Grammar review and conversational practice.

5. Intermediate Russian (4) II. Grant and staff
Discussion—4 hours; laboratory—1 hour. Prerequisite: course 4. Grammar review. Introduction to literature. Conversational practice.

6. Intermediate Russian (4) III. Grant and staff
Discussion—4 hours; laboratory—1 hour. Prerequisite: course 5. Grammar review. Intermediate conversation and continued reading of literature.

10. Elementary Conversation (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: course 1; course 2 or 3 (concurrently). Conversational practice to improve pronunciation and master spoken idioms. May be repeated for credit up to a maximum of 6 units.

20. Elementary Scientific Translation (4) II, III. Gallant and staff
Discussion—3 hours; individual translation projects—1 hour. Prerequisite: course 1SC or 1SCI. Continuation of course 1SC or 1SCI. A translation course for students in the natural sciences working on Russian articles selected from their major fields of interest.

30. Great Russian Writers (in English) (4) III. Grant
Lecture—3 hours; written reports. Introduction to the important prose and dramatic works of such writers as Gogol, Turgenev, Dostoevsky, Tolstoy, Chekhov, Sholokhov, and Pasternak.

41. Survey of Nineteenth-Century Russian Literature (in English) (4) I, Bennett, Laferrière
Lecture—3 hours. Introduction to dominant literary trends, major literary figures and landmarks of Russian prose and poetry from the period of Sentimentalism through Romanticism and Realism to the beginnings of Modernism. Offered in even-numbered years.

42. Survey of Twentieth-Century Russian Literature (in English) (4) II. Laferrière, Bennett
Lecture—3 hours. Introduction to major literary trends such as Symbolism, Acmeism, Futurism, Neorealism, and Socialist Realism. Readings from representative writers such as Gorky, Bely, Pasternak, Solzhenitsyn, and Tertz. Offered in odd-numbered years.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Tumins in charge)
(P/NP grading only.)

Upper Division Courses

101A. Advanced Russian (4) I. The Staff
Lecture—2 hours; discussion—1 hour; oral reports. Prerequisite: course 6. Topics in Russian grammar for the advanced student. Reading and discussion of contemporary literary and journalistic texts. Conversation exercises utilizing literary and colloquial variants of current Soviet speech.

101B. Advanced Russian (4) II. The Staff
Lecture—2 hours; discussion—1 hour; oral reports. Prerequisite: course 101A. Topics in Russian grammar for the advanced student. Reading and discussion of contemporary literary and journalistic texts. Conversation exercises utilizing literary and colloquial variants of current Soviet speech.

101C. Advanced Russian (4) III. The Staff
Lecture—2 hours; discussion—1 hour; oral reports. Continuation of course 101B. Topics in Russian grammar for the advanced student. Reading and discussion of contemporary literary and journalistic texts. Conversation exercises utilizing literary and colloquial variants of current Soviet speech.

102. Russian Composition (4) I. The Staff
Discussion—3 hours; individual tutorial with instructor. Prerequisite: course 6. Practice in writing Russian. One composition on a different topic each week. Topics include: history, geography, politics, and literature of Russia; comparison of Soviet and American lifestyles; current events. Conducted in Russian. Offered in even-numbered years.

103. Literary Translation (4) III. Laferrière

Discussion—3 hours. Prerequisite: course 101C. Translation of Russian literary texts into stylistically equivalent idiomatic English. Offered in even-numbered years.

104. Scientific Translation (4) III. Gallant and staff
Discussion—3 hours; individual translation projects—1 hour. Prerequisite: course 20 or 101A. Techniques of translating Russian scientific texts. Science students will select articles from their fields of interest; Russian students will work on materials assigned by instructor. Offered in odd-numbered years.

105. Advanced Russian Conversation (4) II. The Staff
Conversation—3 hours; preparation of texts—1 hour. Prerequisite: course 6. Intensive conversational practice and discussion based on current events and contemporary texts. Offered in even-numbered years.

120. Medieval Literature and Eighteenth-Century Classicism (in English) (4) III. Tumins
Lecture—3 hours; discussion—1 hour. Survey of medieval epics, chronicles, and tales; of the early development of prose and of Baroque literature. Also Classicism and Sentimentalism will be studied. Offered in even-numbered years.

121. Nineteenth-Century Russian Prose (in English) (4) II. Laferrière, Bennett, Tumins
Lecture—3 hours; term paper. The development of prose from Pushkin and Gogol, through Dostoevsky and Tolstoy, to Maxim Gorky. Other writers are selected sequentially: Turgenev, Goncharov, Pisemsky, Saltykov, Chekhov. Romanticism, the Natural School, critical realism, and psychological realism are covered. Offered in odd-numbered years.

123. Twentieth-Century Russian Prose (in English) (4) II. Laferrière, Bennett
Lecture 3 hours; term paper. Examination of various trends including Acmeism, Symbolism, Neorealism, and Socialist Realism in development of prose. Readings from such writers as Gorky, Zamiatin, Sholokhov, Pasternak, and Solzhenitsyn. Offered in even-numbered years.

126. The Russian Theater (in English) (4) III. Bennett, Laferrière
Lecture—3 hours; discussion—1 hour. The main works of Russian dramatists from Gogol to the present, including Turgenev, Tolstoy, Chekhov, Gorky, Mayakovsky, Bulgakov, Shvarts. Offered in odd-numbered years.

127. Nineteenth-Century Russian Poetry (4) I, Bennett, Laferrière
Discussion—3 hours; term paper. Prerequisite: course 6. Introduction to the principles of Russian versification followed by historical and poetic analysis of the following figures: Derzhavin Zhukovskiy, Tjutchev, and Fet. Conducted in Russian. Offered in odd-numbered years.

128. Twentieth-Century Russian Poetry (4) I, Bennett, Laferrière
Discussion—3 hours; term paper. Prerequisite: course 6. Introduction to the principles of Russian versification followed by historical and poetic analysis of the following figures: Brjusov, Blok, Akhmatova, Mandelstam, Esenin, Mayakovsky, Khlebnikov, Pasternak, Evtushenko, Voznesensky, and Brodsky. Conducted in Russian. Offered in even-numbered years.

140. Dostoevsky (in English) (4) I. Tumins
Lecture—3 hours. Reading and analysis of Dostoevsky's principal works such as *Crime and Punishment*, *The Idiot*, *The Brothers Karamazov*, and *The Diary*. Study of social and political views as reflected in Dostoevsky's works. Offered in even-numbered years.

141. Tolstoy (in English) (4) I, Bennett
Lecture—3 hours. Study of Leo Tolstoy's literary evolution and moral quest. Readings include his *Confession*, a major novel such as *War and Peace* or *Anna Karenina*, and representative shorter fiction. Offered in odd-numbered years.

150. Russian Culture (4) III. Tumins
Discussion—3 hours; term paper. Knowledge of Russian not required. Study of Russian culture in the nineteenth and twentieth centuries. Brief introduction of the beginnings up to the nineteenth century. Russian art, music, philosophy, church, traditions, and daily life. Offered in odd-numbered years.

154. Russian Folklore (4) III. Bennett
Lecture—3 hours; term paper. Knowledge of Russian not required. Russian folklore, rituals, and history will be analyzed and compared with folklore of other peoples. Sociological implications of attitudes toward family unit, children, etc. Influences of folklore on Russian literature and historiography. Offered in even-numbered years.

***160. Russian Phonology and Morphology** (4) III. Gallant
Lecture—3 hours; laboratory—1 hour. Prerequisite: course 101A, 101B, or consent of instructor. Linguistic analysis of the Russian sound system and of Russian word-formation. Offered in odd-numbered years.

NOTE: For key to footnote symbols, see page 130.

192. Research Essay (2) I, II, III. The Staff
Prerequisite: a Russian literature course (may be taken concurrently). A research essay, based on primary and secondary sources, dealing in depth with a topic arising from or related to the prerequisite literature course. May be repeated for credit.

194H. Special Study for Honors Students (5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: open only to honors students. Guided research leading to an honors paper.

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200. Old Church Slavic (4) I, Gallant
Lecture—3 hours; reading projects. A synchronic and diachronic analysis of Old Church Slavic. Offered in even-numbered years.

202. History of the Russian Language (4) II. Gallant
Lecture—2 hours; reading projects—2 hours. Prerequisite: course 200 or consent of instructor. Survey of Russian historical grammar and the development of the Russian literary language. Reading in the original texts from the eleventh to the eighteenth century. Offered in odd-numbered years.

204. Descriptive Russian Grammar (4) III. Gallant
Lecture—3 hours; reading projects—1 hour. Introduction to modern Russian phonology and morphology. Offered in even-numbered years.

210A. Style and Syntax (4) I, Bennett, Tumins
Discussion—3 hours; reading projects—1 hour. Examination of stylistic differences between spoken and written Russian.

210B. Style and Syntax (4) II. Tumins, Bennett
Discussion—3 hours; reading projects—1 hour. Prerequisite: course 210A or consent of instructor. Examination of stylistic differences between spoken and written Russian.

220. Old Russian Literature (4) II. Tumins
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 even-numbered years.

221. Eighteenth-Century Russian Literature (4) II. Tumins
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 odd-numbered years.

222. Nineteenth-Century Russian Literature (4) I, Bennett, Tumins, Laferrière
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 odd-numbered years.

***223. Early Twentieth-Century Russian Literature** (4) I, Bennett, Laferrière
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 are studied. Offered in even-numbered years.

224. Soviet Russian Literature (4) III. Laferrière
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 odd-numbered years.

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

300. The Teaching of Russian (2) I, II, III. Gallant
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.

Russian Literature and History

(College of Letters and Science)

Program Office, 176 Voorhies Hall (752-1630)

Committee in Charge

- Valerie A. Tumins, Ph.D. (*Russian*), Committee Chairperson
- ²Robert O. Crummey, Ph.D. (*History*), Winter-Spring Quarters
- ⁴C. James Gallant, Ph.D. (*Russian*), Fall-Winter Quarters
- Alexander J. Groth, Ph.D. (*Political Science*)

The Major Program

The Russian Literature and History major is designed to give the student a better understanding of Russia through the study of its literature and history, two fields closely related in its intellectual and cultural development. The program thus allows the student to concentrate on a single rich and creative culture other than his own. Majors are encouraged to extend their study of Russia beyond the confines of the two core subjects, literature and history, to include related subjects such as art, economics, folklore, geography and politics or neighboring regions like Eastern Europe.

The major will prepare a student for graduate studies in either field—Russian history or Russian literature—or in a similar combined program. In either case, students planning on graduate work should continue to study the Russian language through Russian 101A-101B-101C and beyond.

Russian Literature and History

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	20-50
Three courses from History 3, 4A, 4B, 4C, 10, 30	12
Russian 1 through 6 (or the equivalent)	0-30
Russian 41, 42	8
Recommended: Economics 1A-1B and/or Political Science 2 or 2D highly recommended.	
Depth Subject Matter	36-37
Three courses from History 102F, 137A, 137B, 137C, 138	12-13
At least three courses from Russian 120, 121, 123, 126, 127, 128, 140, 141	12
At least three courses from Anthropology 121; Economics 117; Geography 123B, 124; History 143A, 143B, 143C; Political Science 131, 141, 149; Russian 150, 154	12
Total Units for the Major	56-67

Major Adviser. R. O. Crummey (*History*).

Minor program Requirements:

The minor in Russian Literature and History is open to all Letters and Science students except those with majors in History or Russian.

	UNITS
Russian History and Literature	24
Three courses from History 102F, 137A, 137B, 137C, 138	12
Three courses from Russian 120, 121, 123, 126, 127, 128, 140, 141	12

Scandinavian

(College of Letters and Science)

Department Office (German and Russian), 416 Sproul Hall (752-2114)

Faculty

Fritz Sammern-Frankenegg, Ph.D., Associate Professor (*Swedish, German*)

Course in Scandinavian

Upper Division Course

110. Masterworks of Scandinavian Literature in Translation (4) III. Sammern-Frankenegg
Lecture—3 hours; written reports. Readings in English translation from Icelandic Saga to the present, treating such major authors as Ludvig Holberg, Sören Kierkegaard, Henrik Ibsen, Sigrid Undset, August Strindberg, Selma Lagerlöf, Pär Lagerkvist. Content varies from year to year. May be repeated twice for credit.

Courses in Swedish

Lower Division Courses

1. Elementary Swedish (6) I, Sammern-Frankenegg
Discussion—5 hours; language laboratory—two ½-hour sessions. (Students who have successfully completed Swedish 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 Swedish (6) II. Sammern-Frankenegg
Discussion—5 hours; language laboratory—two ½-hour sessions. Prerequisite: course 1.

3. Intermediate Swedish (6) III. Sammern-Frankenegg
Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 2.

6A. Spoken Swedish (2) III. Sammern-Frankenegg
Discussion—2 hours. Prerequisite: course 2. Conversational practice based on everyday vocabulary of modern spoken Swedish. May be taken concurrently with course 3. (P/NP grading only.)

Sociology

(College of Letters and Science)

John T. Walton, Ph.D., Chairperson of the Department

Department Office, 135 Young Hall (752-0782)

Faculty

- James C. Cramer, Ph.D., Assistant Professor
- Forrest Dill, Ph.D., Assistant Professor
- Ruth Dixon, Ph.D., Associate Professor
- Bruce Hackett, Ph.D., Associate Professor
- Gary G. Hamilton, Ph.D., Associate Professor
- ²James P. Hawley, Ph.D., Assistant Professor
- Carl C. Jorgensen, Ph.D., Associate Professor
- Edwin M. Lemert, Ph.D., Professor Emeritus
- ⁴John Lofland, Ph.D., Professor
- ⁴Lyn Lofland, Ph.D., Associate Professor
- Leon H. Mayhew, Ph.D., Professor
- Daniel M. Ramirez, Ph.D., Assistant Professor
- ²Judith Stacey, M.A., Assistant Professor
- Julius Roth, Ph.D., Professor
- John F. Scott, Ph.D., Professor
- John T. Walton, Ph.D., Professor

The Major Program

Sociology focuses on the structure of human interaction and the processes or institutions that both control and emerge from it. The special features of families, tribes, communities, formal organizations, and nation-states, as well as the processes of courtship, conflict and domination, delinquency, religious conversion, and artistic creation are among the major subjects of study. Graduate degrees in the field have traditionally led into teaching careers; increasingly, however, career possibilities include the application of sociological knowledge to the areas of penology and correction, education, industrial management, regional and community planning, and the administration of hospitals and health care systems.

A student may elect to complete requirements for the general major or, if desiring to specialize, complete the Law and Society or Social Welfare option.

Sociology

A.B. Degree Requirements:

	UNITS
Preparatory Subject Matter (General Major)	25
Sociology 1, 46A, 46B (or the equivalent)	13
Select 12 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	12
Depth Subject Matter	36
Sociology 165A, 165B	8
Select 8 units from Sociology 126, 140, 180	8
At least 20 additional units in upper division sociology courses to achieve a minimum of 36 units	20
Total Units for the Major	61

Recommended

Anthropology 102, 118, 119A, 119B, 124, 128; History 101, 102; Philosophy 12, 21, 22, 23, 109, 151, 156; Political Science 150, 161; Psychology 145; Statistics 106, 108.

Sociology

A.B. Degree Requirements:

(Options: Law and Society; Social Welfare)

	UNITS
Preparatory Subject Matter (for either option)	25-27
Sociology 1, 3, 46A, 46B	17
Two courses from Anthropology 1, 2, Economics 1A, 1B, History 3, 4B, 4C, 17A, 17B, Philosophy 1, 12, 21, 22, 23, Political Science 1, 4, Psychology 1, 15	8-10
Depth Subject Matter	40
Law and Society Option:	
Sociology 152, 155	8
Sociology 120 or 150	4
At least 4 but not more than 8 units of Sociology 109A, 109B, 109C	4
At least three courses from Sociology 123, 130, 140, 143, 156, 165B, 180, 185	12
At least 12 additional units in upper division sociology courses to achieve a minimum of 40 units	12
Social Welfare Option:	
Sociology 131, 140, 185	12
At least 4 but not more than 8 units of Sociology 109A, 109B, 109C	4
At least one course from Afro-American Studies 100, American Studies 124, 156, 170, 171, Asian American Studies 110, 111, Native American Studies 124, 156, 170, 171, Spanish 124, Sociology 129, 169	4
At least three courses from Sociology 127, 132, 143, 152, 154, 156, 165B, 180	12

NOTE: For key to footnote symbols, see page 130

At least 8 additional units in upper division sociology courses to achieve a minimum of 40 units	8
Total Units for the Major	65-67

Recommended

Anthropology 1, 118, 119A, 119B, 124, 128; History 101, 102; Philosophy 12, 21, 22, 23, 102, 109, 118, 151, 156; Political Science 150, 161; Psychology 145; Statistics 106, 108.

Major Advisers. Consult the Department Office.

Minor Program Requirements:

The Department of Sociology has established the following minor programs of study which are open to Letters and Science students.

	UNITS
Sociology	20
Eight units selected from Sociology 126, 140, 165A, 165B, 180	8
Additional upper division units in Sociology	12
Sociology—Social Welfare	20
Sociology 185, plus 4 units selected from Sociology 109A, 131, 140	8
Four units from Sociology 143, 154, 156, 165B, or 180	4
Additional upper division units selected from Sociology 120, 123, 127, 130, 132, 152	8
Sociology—Law and Society	20
Sociology 152, plus 4 units selected from Sociology 109A, 120, 150	8
Four units from Sociology 140, 143, 165B, 180	4
Additional upper division units selected from Sociology 123, 130, 155, 156, 185	8

Minor Advisers. Consult the Department Office.

Teaching Credential Subject Representative. J. Roth. See page 105 for the Teacher Education Program.

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 Advisers. See *Class Schedule and Room Directory*.

Courses in Sociology

Lower Division Courses

1. Introduction to Sociology (5) I, III. 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.

3. Social Problems (4) II, III. The Staff. Lecture—3 hours; discussion—1 hour. General sociological consideration of contemporary social problems in relation to sociocultural change and programs for improvement.

***7. Seminar in Sociological Analysis** (4) I, II, III. The Staff. 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.

***9A-9B-9C. Seminar in Sociological Analysis** (2-2-2) I-II-III. The Staff. Seminar—2 hours. Research and analysis using basic concepts of sociology, social organization, culture, socialization, stratification in application to specific problems. Course must be completed within one academic year. May be repeated for credit with consent of instructor. Limited enrollment. (Deferred grading only, pending completion of sequence.)

***15A-15B-15C. Universities** (4-4-4) I-II-III. Hackett. Lecture—2 hours; discussion—1 hour; laboratory—1 hour. Prerequisite: enrollment in Experimental Freshman Program. Study of the history, social structure, and functions of contemporary American universities, with special reference to the University of California, Davis.

25. Sociology of Popular Culture (4) I. The Staff. Lecture—4 hours. The historical emergence of popular culture. "High" culture, "folk" culture and "mass" culture; the

democratization of culture values; the organization of popular tastes, characteristic art forms of popular culture: literature, music, the graphic arts. The social structure of audiences.

40. Computers and Social Research (12) I, II. Cramer. Lecture—2 hours; exercises. Elementary introduction to the use of computers in the social sciences. Topics include use of canned programs such as SPSS and MINITAB, data preparation and elementary analysis, and simulations and games. No prior knowledge of FORTRAN or statistics necessary. Those who have had ENGINEERING 5 or Mathematics 19 or 29 can receive only 1 unit of credit for Sociology 40. (P/NP grading only.)

46A. Introduction to Social Research (4) I. The Staff. Lecture—4 hours. 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. The Staff. Lecture—4 hours. Prerequisite: course 46A. Data-analysis techniques, measurement, scaling, multivariate analysis, and quantitative measures of association.

98. Directed Group Study (1-5) I, II, III. The Staff (Walton 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 (Walton in charge). Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

102. Sociology of the Environment (4) I. The Staff. Lecture—3 hours; laboratory—2 hours. Prerequisite: one college level course in mathematics or statistics and upper division status. Course will examine two questions: (1) What is the effect of environmental change on social systems? (2) How can such change be measured? Systems to be studied include economics, population, recreation, transportation, institutions, and values. Laboratory and field work in measurement of effects.

103. Evaluation Research Methods (5) II. Cramer. Lecture—3 hours; discussion—1 hour; field research. Prerequisite: course 46A and 46B 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.

***105A-105B. Laboratory in Survey Research** (5-5) I-II. The Staff. Lecture—4 hours; laboratory—3 hours. Study design, drawing a sample from the city of Sacramento, and analysis of the data collected. Provides an introduction to survey methods, nonexperimental research, and data collection and analysis. (Deferred grading only, pending completion of sequence.)

106. Intermediate Social Statistics (4) I. Lecture—4 hours. Prerequisite: course 46B. An 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, II, III. The Staff. 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.

108. Sociological Analysis (4) III. J. Lofland. Lecture—3 hours; discussion—1 hour; term project. Steps in process of developing qualitative analysis with emphasis on generating qualitative depictions of social structures, causes, functions, processes, and strategies. Survey of substantive principles helpful in developing new sociological analyses.

109A-109B-109C. Practicum in Sociological Analysis (4-4-4) I-II-III. The Staff. Seminar—2 hours. fieldwork. Prerequisite: upper division standing or consent of instructor. Research and analysis of social settings; designed to give students practical field experience in as well as analytical training for analyzing, an institutional setting. Nonacademic guest speakers will augment class discussion. A maximum of 8 units will count towards major.

110. Sociology of Chicano Culture (4) II. Ramirez
Lecture—3 hours; research project. Mexican-American culture is examined in relation to the American social structure. Cultural conflict and the origins of cultural nationalism among Mexican-Americans. Emphasis on Mexican-American symbol systems and the problem of self-identity.

118. Political Sociology (4) II. The Staff
Lecture—4 hours. 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. Sociology of Military Institutions** (4) II.
Lecture—4 hours. Prerequisite: course 1. Relationship of military institutions to the political, economic, and class structure of historic and contemporary societies. The impact of professionalism and bureaucratic organization. The application of social theory to the analysis of such phenomena as militarism, the *coup d'etat*, revolutionary war, etc.

120. Deviation and Society (4) II. Dill
Lecture—4 hours. 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) III. The Staff
Lecture—4 hours. 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, Scott
Lecture—4 hours; essay take-home examinations. 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 (determined by instructor for each offering). 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.

125. Sociology of Intellectual Life (4) I, Mayhew
Lecture—4 hours. Sociological analysis of the intelligentsia; types of intellectuals, theories concerning their social role; research on the social sources of intellectual work in politics, literature, art and science; historical considerations of intellectual milieu; international comparisons of intellectuals.

126. Social Interaction (4) I, J. Lofland
Lecture—4 hours. 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—4 hours. 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.

129. Sociology of Black Experience in America (4) II, Jorgensen
Lecture—3 hours; discussion, research, or term paper (determined by instructor for each offering). 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. The Staff
Lecture—4 hours. 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) II. The Staff
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 Sex Roles (4) II.
Lecture—3 hours; discussion—1 hour. Analysis of biological, psychological, cultural and structural conditions under-

lying the status and roles of men and women in contemporary society, drawing on a historical and comparative perspective.

133. Sexual Stratification and Politics (4) III. Stacey
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.

139. Corporations and Society (4) III. Hawley
Lecture—3 hours; research project—1 hour. 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) II. The Staff
Lecture—4 hours. 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—4 hours. 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. Sociological factors in transportation. Consequences of transport mode development on social organization, sociological influences in transport mode choice. Transportation issues in public policy.

143. Urban Society (4) II, L. Lofland
Lecture—4 hours. Urbanization as a social process; comparison of urban, suburban, metropolitan and rural phenomena; types of cities; the subcultures of cities; the urban future.

144. Rural Society (4) III. The Staff
Lecture—4 hours. The characteristics of rural social systems in contrast to urban; the nature of peasant and folk societies; the impact of social change upon rural community life considered from the standpoint of regional differences in the United States and selected world areas.

***146. Sociology of Religion** (4) II. The Staff
Lecture—4 hours. The 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.

147. Sociological Perspectives on East Asia (4) III. Hamilton
Lecture—4 hours. 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.

148. Collective Behavior (4) II. The Staff
Lecture—4 hours. Analysis of the characteristics, causes and consequences of noninstitutionalized collective actions; fads, panics, expressive crowds, riots, social and revolutionary movements.

150. Criminology (4) II. The Staff
Lecture—4 hours. Sociological analysis of criminal behavior in relation to social structure and the criminalization process.

152. Juvenile Delinquency (4) I.
Lecture—4 hours. 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, Roth
Lecture—4 hours. An overview of sociological research in medicine and health care, with emphasis on the organizational, institutional and social psychological aspects.

155. Sociology of Law (4) III. The Staff
Lecture—4 hours. 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) I, J. Lofland
Lecture—3 hours; discussion, term paper or project (to be decided by instructor each time course is offered)—1 hour. 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.

***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) III. Roth
Lecture—4 hours. The 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) I. The Staff
Lecture—4 hours. A 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) II. The Staff
Lecture—4 hours. 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.

169. Research in the Chicano Community (4) III. Ramirez
Lecture—3 hours; research project. Prerequisite: course 46A. Problems of understanding the Mexican-American in various types of social settings: how to conduct social research in such settings. Conceptual and data gathering problems peculiar to this area of study, and developing strategies and skills for overcoming them.

170. Population (4) III. Scott
Lecture—4 hours. 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.

***173. Sociology Through Literature** (4) II. The Staff
Lecture—4 hours. 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.

***175. Sociology of Communication** (4) II. The Staff
Lecture—4 hours. Studies of mass communications, media, and public opinion; theories of information flow, ideology, group and personal influence on opinion formation.

***176. Sociology of Knowledge** (4) III.
Lecture—4 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 every day life.

180. Complex Social Organization (4) III. Hackett
Lecture—4 hours. The forms and processes of contemporary social organization. Comparative analysis of the problems of organizing families, business firms, government agencies, schools, political movements, religious ceremonies and utopian communities.

***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.

185. Sociology of Social Welfare (4) III.
Lecture—4 hours. A sociological analysis of the evolution and current organization of welfare functions in modern societies.

197T. Tutoring in Sociology (1-4) I, II, III. The Staff (Walton in charge)
Prerequisite: upper division standing in sociology and consent of Department Chairperson. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Walton in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Walton in charge)
Prerequisite: open to seniors only. (P/NP grading only.)

Graduate Courses

205. Methodological Critique of Research (4) III.
Lecture—4 hours. Methodological analysis and criticism of empirical research exemplifying different types of research design. Examination of surveys, experiments, historical and comparative studies, and studies using biographical and demographic data.

207A-207B. Methods of Quantitative Research (4-4) II-III. 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) I. Hawley 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.

219A-219B. Behavioral Political Sociology (4-4) I-II. Seminar—4 hours. Development of behavioral and empirical political sociology; study of conflict, discontent, community politics, the international system, game theory, and coalition formation. Empirically grounded theories.

220. Deviance, Law, and Social Control (4) I. The Staff Seminar—3 hours. 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.

224. Sociology of Education (4) II. Scott Seminar—4 hours. Structural differentiation of and relationship among socializing agencies. Comparison of educational institutions among societies. Industrialization and secularization. Political control, education and occupational placement, professionalization of educators. Current trends and recent research.

226. Sociological Social Psychology (4) II. The Staff Lecture—2 hours; discussion—2 hours. Prerequisite: course 126 or consent of instructor. Advanced study of approaches to sociological social psychology with particular attention to symbolic interactionism and ethnomethodology.

230. Ethnic (Race) Relations (4) III. 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. Stacey Seminar—3 hours; seminar paper—1 hour. 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., Engles, Parsons, Freud, Horkheimer, Goode, Lasch, Mitchell). Emphasis on macro and historical questions.

242A-242B. Comparative Methods in Historical Sociology (4,4) II-III. Hamilton 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. (Deferred grading only, pending completion of sequence.) Offered in even-numbered years.

243. Urban Society (4) III. 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.

248. Collective Behavior and Social Movements (4) II. 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) III. Roth Seminar—3 hours; paper. Prerequisite: open to graduate students 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. 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.

NOTE: For key to footnote symbols, see page 130

264. Proseminar in Sociology (4) I. L. Lofland Seminar—4 hours. Prerequisite: limited to first year Sociology graduate students. Introduction to sociological concepts at an advanced level. Subjects include culture, social interaction, stratification, deviance, demography, collective behavior, organizations and other topics in which the department offers further specialized work. Various approaches to sociological analysis are examined.

265. Sociological Theory (4) II. Lecture and discussion—3 hours. Prerequisite: courses 165A, 165B; or consent of instructor. The emergence of sociological thinking as part of the history of ideas; the application of sociological analysis to sociological ideas. The French sociological tradition from Saint-Simon to Durkheim; the influence of Marxist thinking on subsequent sociological ideas.

270. Social Demography (4) III. 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) II. 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 (Chairperson in charge) Seminar—3 hours. (S/U grading only.)

292A-292B. Field Research (4-4) I-II. L. Lofland, J. Lofland 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. (Deferred grading only, pending completion of sequence.) Offered in odd-numbered years.

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.)

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 is designed to provide preparation for a career involving these resources as well as for a more general interest in resource use and protection. 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, general soil science, and general water science. (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.) The flexibility of this major makes possible a wide variety of career opportunities which includes managerial and technical positions with agri-businesses such as equipment and supply companies, farm management, and positions involving advising, planning, land appraisal, research, and teaching with private, district, county, state, federal, and interna-

tional organizations dealing with soil and water development, use, and conservation.

Soil and Water Science

B.S. Major Requirements:

(For convenience in program planning the *usual* course 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
Preparatory Subject Matter	62-65
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Mathematics, including calculus, statistics, and computer programming	13
Chemistry, including Chemistry 1A-1B or 4A-4B and a more advanced course	13
Physics (Physics 2A-2B-2C or 8A-8B-8C)	9-12
Geology (Geology 2)	3
Economics or agricultural economics	3
Written expression (see College requirement)	7
Oral expression (see College requirement)	4
Depth Subject Matter	51
Physical sciences, biological sciences and/or mathematics with approval of adviser	18
Soil Science 2-2L	4
Water Science 100	4
Additional upper division units in soil science and water science	22
Special study or experience (199 or Soil Science 192 in the major area)	3
Breadth Subject Matter	22
Social sciences and humanities†	13
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
Restricted Electives	21
To supplement or expand areas of student interest selected with approval of adviser.	
Unrestricted electives	21-24
Total Units for the Major	180

Major Adviser. J.W. Biggar (*Land, Air and Water Resources*).

Information Center for the major is the Resource Sciences Teaching Center, 122 Hoagland Hall (752-1669).

Graduate Study. See page 99.

Soil Science

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Land, Air and Water Resources.

Related Major Program. See the major in Soil and Water Science, this page.

Graduate Study. Programs of study leading to the M.S. and Ph.D. degrees are available. Information regarding these programs can be obtained from the graduate adviser and the *Announcement of the Graduate Division*.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Graduate Advisers. F.E. Broadbent, D.N. Munns, H.M. Reisenauer (*Land, Air and Water Resources*)

Related Courses. See Plant Science 116, 130; Environmental Horticulture 120. See also courses in Atmospheric Science, Resource Sciences, and Water Science.

Courses in Soil Science

Questions pertaining to the following courses should be directed to the instructor or to the Resource Sciences Teaching Center, 122 Hoagland Hall (752-1669).

Lower Division Courses

2. Introduction to Soil Science (3) II, Whittig; III, Munns
Lecture—3 hours. Prerequisite: Chemistry 1A-1B and Biological Sciences 1; Physics 1B recommended. Development and properties of soils; interactions between the solid, aqueous, gaseous, and biotic soil components; technical aspects of management, development and conservation of soils.

2L. Introductory Soil Science Laboratory (1) II, Delwiche; III, Munns
Laboratory—3 hours. Prerequisite: course 2 (may be taken concurrently) and consent of instructor. Laboratory exercises and demonstrations illustrating and supplementing principles embodied in course 2, and providing greater depth of treatment of subject areas.

92. Soil Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn experience off and on campus in soil science. Internship supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

102. Soil and Water Chemistry (5) II, Burau
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 2 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. Begg, Huntington
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. Transfer Processes in Soil (4) I, Rolston
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 2; Water Science 2; Mathematics 16A or 21A; or the equivalent preparation in elements of soil and water, and calculus. Principles of water, gas, heat, and solute movement in soil with selected examples related to agricultural and urban use of land. Influence of soil physical properties on transfer processes and root growth.

109. Soil Fertility and Fertilizers (4) I, Reisenauer
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 2 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. Geomicrobiology (4) I, Broadbent
Lecture—3 hours; laboratory—3 hours. Prerequisite: general chemistry and an introductory course in biology. Major groups of microorganisms in the geosphere and their responses to environmental variables. Activities of microorganisms in relation to water pollution, solid waste disposal, pesticide degradation, and soil fertility.

118. Soils in Land Use and the Environment (4) II.
Lecture—3 hours; discussion—1 hour; two 1-day field trips. Prerequisite: course 2 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 and Morphology (2) II, Begg
Lecture—2 hours. Prerequisite: course 2; Geology 1 or 2; or consent of instructor. Soil forming factors and how these factors affect soil properties and soil morphological characteristics. Soil forming processes as they influence the genesis and features of the soil profile. Soil-landform relationships.

120L. Soil Genesis and Morphology Laboratory (1) II, Begg
Laboratory—3 hours (including 4 Saturday field trips). Prerequisite: course 120 (may be taken concurrently). Identification and description of soil morphological characteristics. Use of thin sections and the petrographic microscope to identify micropedological features. Field trips to study soil parent material, soil-climate, soil-vegetation, and soil-landform relationships.

121. Soil Classification and Mapping (3) III, Huntington
Lecture—2 hours; laboratory—3 hours (seven of the ten sessions are in the field). Prerequisite: course 120, 120L; course 118 recommended. Course introduces systems of soil classification to develop broader understanding of soils on the landscape and a basis for soil resource inventory; procedures used in soil survey introduced. Laboratory-field studies provide practice in morphological soil description and soil mapping.

***122. Salt-Affected Soils** (3) II.
Lecture—3 hours. Prerequisite: consent of instructor; a course in soil chemistry and either plant physiology or plant nutrition recommended. Soil problems in salt-prone arid zone climates; origin and encroachment of salts; chemical interactions with soil minerals under alkaline situations; salinity control in relation to environmental quality; physiological characteristics of native and crop plant species governing salt tolerance and sensitivity. Offered in even-numbered years.

123. Soil Taxonomy (3) II, Huntington
Lecture—1½ hours; discussion—1½ hours. Prerequisite: courses 120, 120L and 121, or consent of instructor. An intermediate course in soil classification. Study and analysis of the current system of classification used by the National Cooperative Soil Survey of the United States. Practice in classifying soil individuals with emphasis on evaluating their placement in the system. Offered in even-numbered years.

***150. Soil and Plant Testing** (3) III.
Lecture—3 hours. Prerequisite: introductory course in soil science; knowledge of quantitative analytical techniques and soil-plant interrelationships recommended. Methods and interpretation of soil and plant analyses for the diagnosis of problems associated with the mineral nutrition of plants.

192. Soil Science Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn 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)
Directed group study in soil science for advanced undergraduates. (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. Soil Physics** (3) II, Rolston
Lecture—3 hours. Prerequisite: Mathematics 22B or consent of instructor; course 107 recommended. Physical processes occurring in soils with emphasis on heat flow, diffusion of gases and solutes, the movement of soluble materials during leaching and irrigation, mechanics, and applications of physics and mathematics to soil systems. Offered in even-numbered years.

208. Soil-Plant Interrelationships (3) II, Rendig
Lecture—3 hours. Prerequisite: course 2; Botany 111B; or consent of instructor. Processes and reactions involved in the acquisition by plants of nutrients from soils; the root-soil interface; physiological reactions involved in the assimilation of nutrients; soil factors and crop quality.

211. Soil Microbiology (2) II, Broadbent
Lecture—2 hours. Prerequisite: Chemistry 8B, course 102, or consent of instructor. Activities of some important groups of soil microorganisms, metabolism of organic substances in soil including pesticides; influence of microbial activities on soil properties, microbial activities in soil in relation to some environmental problems.

214. Soil Mineralogy (5) I, Whittig
Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: a course in soil chemistry or consent of instructor. Nature, properties, and occurrence of the more common minerals in soils and rocks. Application of mineral analysis methods, including X-ray, thermal and chemical for characterization of mineral systems, and in the study of properties of soils and weathering of minerals. Offered in even-numbered years.

215. Physical Chemistry of Soils (3) III, Burau
Lecture—3 hours. Prerequisite: Chemistry 107B or 110B. or

consent of instructor. Physicochemical, colloidal, and surface aspects of the soil system. Offered in even-numbered years.

***218. Soil Erosion and Conservation** (2) III, Singer
Lecture—1 hour; discussion—1 hour. Prerequisite: course 118, 120 and graduate standing. 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 even-numbered years.

290. Special Topics in Soil Science (1) I, III, Delwiche
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.)

291. Current Literature in Plant Nutrition (1) I, II, III. The Staff (Reisenauer in charge)
Seminar—1 hour. Prerequisite: graduate standing in Soil Science, Plant Physiology, Ecology, or related subject, and consent of instructor. The current literature in plant nutrition and soil-plant relationships will be reviewed and discussed. Each participant will prepare and present reports to the seminar. (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.)

Spanish

(College of Letters and Science)

Robert M. Scari, Ph.D., Chairperson of the Department

Department Office (Spanish and Classics), 616 Sproul Hall (752-0835)

Faculty

Reed Anderson, Ph.D., Associate Professor
Donald G. Castanien, Ph.D., Professor
Mariano González, Ph.D., Lecturer
³Didier T. Jaén, Ph.D., Professor
Daniel S. Keller, Ph.D., Associate Professor
^{2,3}Guillermo Rojas, Ph.D., Associate Professor
Fabián A. Samaniego, M.A., Lecturer
¹Antonio Sánchez-Romero, Ph.D., Professor
Robert M. Scari, Ph.D., Professor
²Máximo Torreblanca, Ph.D., Associate Professor
Hugo J. Verani, Ph.D., Associate Professor

The Major Program

The major in Spanish is designed to develop competence in the spoken and written language and to provide the possibility of emphasis either on language or on literature, depending upon each student's professional goal. The program, alone or in combination with other major programs, may lead to advanced study of the language or literatures 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. Spanish majors are strongly encouraged to complement their work in the department through studies in related areas such as Mexican-American studies, international relations, linguistics, comparative literature, art, history, and philosophy.

Spanish

A.B. Major Requirements:

Preparatory Subject Matter	UNITS
Spanish 1 or 1AT, 2 or 2AT, 3 or 3AT, 4 or 7A, 5 and 6 or 7B, 28 or 7C (or the equivalent)	0-33
	0-33

Depth Subject Matter	40
Spanish 103A-103B	8
Spanish 110A or 110B	4
Spanish 134, 135, or 136	4
Any two courses from Spanish 104A, 104B, 105A, or 105B	8
Additional upper division units	16
To be selected in consultation with a major adviser. These units may be concentrated in a single area such as Spanish language, Spanish literature, or Spanish-American literature, or selected from two or more areas. See recommendations below.	
Total Units for the Major	40-73

Recommended

The following recommendations should be taken into account. Majors who are interested in a concentration in:

- literature are advised to take Spanish 110C (advanced Spanish composition; literary analysis).
- language are advised to take Linguistics 1 (not counted toward major). This course is prerequisite to Linguistics 115 (Chicano sociolinguistics) and 150 (contrastive analysis of Spanish) which may be counted toward the 16 additional upper division units.
- a teaching career are advised to take Spanish 300 (the teaching of Spanish).
- graduate work in Spanish are advised to take Latin 10 or the equivalent.

Major Advisers. M. González, D.S. Keller, G. Rojas, M. Torreblanca, H.J. Verani.

Minor Program Requirements:

Spanish	22-24	UNITS
One course in Spanish literature (any course)	4	
One course in culture from Spanish 134, 135, 136	4	
One course in advanced composition from Spanish 110A, 110B, 110C	4	
One course from Spanish 131, 132, or 133	3-4	
Two elective courses acceptable for the Spanish major chosen in consultation with a major adviser	7-8	
Note: Students majoring in Linguistics or Mexican-American (Chicano) Studies and minoring in Spanish should bear in mind that if Spanish courses are used to satisfy the major requirements, only one of these courses may be applied to the minor.		

Teaching Credential Subject Representative. D. S. Keller. See page 105 for the 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 Division 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. R. Anderson (M.A. degrees); D. T. Jaén (Ph.D. degrees).

Courses in Portuguese**Lower Division Courses**

1. Elementary Portuguese (4) I. The Staff
Laboratory—2 hours; recitation—3 hours. Portuguese grammar, conversation, and reading. (Students who have successfully completed Portuguese 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 Portuguese (4) II. The Staff
Laboratory—2 hours; recitation—3 hours. Prerequisite: course 1. Continuation of course 1.

3. Elementary Portuguese (4) III. The Staff
Laboratory—2 hours; recitation—3 hours. Prerequisite: course 2. Continuation of course 2.

Upper Division Courses

***104. Survey of Brazilian Literature: Prose Fiction (4) I.**
Lecture—3 hours; individual and group conferences. Prerequisite: course 3.

***105. Survey of Brazilian Literature: Poetry (4) II.**
Lecture—3 hours; individual and group conferences. Prerequisite: course 3.

***106. Survey of Brazilian Literature: Drama and Essay (4) III.**
Lecture—3 hours; individual and group conferences. Prerequisite: course 3.

Courses in Spanish**Lower Division Courses**

1. Elementary Spanish (6) I, II, III. The Staff (Samaniego in charge)
Laboratory—two ½-hour sessions; recitation—5 hours. An introduction to the fundamentals of Spanish grammar. Listening and speaking emphasized. (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.)

1ATA-1ATB-1ATC. Individualized Instruction in Elementary Spanish (2-2-2) I-II-III. Samaniego

The three segments of course 1AT correspond to course 1. Student-instructor contacts consisting of individual tutoring conversation practice and testing periods. Students may start at any point and complete one or more two-unit segments in a given quarter. (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 (6) I, II, III. The Staff (Samaniego in charge)
Laboratory—two ½-hour sessions; recitation—5 hours. Prerequisite: course 1. Continuation of course 1.

2ATA-2ATB-2ATC. Individualized Instruction in Elementary Spanish (2-2-2) I-II-III. Samaniego

The three segments of course 2AT correspond to course 2. Student-instructor contacts consisting of individual tutoring, conversation practice and testing periods. Students may start at any point and complete one or more two-unit segments in a given quarter.

3. Intermediate Spanish (6) I, II, III. The Staff (Samaniego in charge)
Laboratory—1 hour; recitation—5 hours. Prerequisite: course 2 or 2AT. Conversational practice based on everyday vocabulary of modern spoken Spanish. Review of grammatical principles and expansion of vocabulary through readings of modern texts.

3ATA-3ATB-3ATC. Individualized Instruction in Spanish (2-2-2) I-II-III. Samaniego
Autotutorial. Prerequisite: course 2 or 2ATA-2ATB-2ATC. Continuation of course 2ATA-2ATB-2ATC.

4. Intermediate Spanish (5) I, II, III. The Staff (González in charge)
Discussion—1 hour; recitation—4 hours. Prerequisite: course 3. Grammar review through oral and written exercises, and expansion of vocabulary through reading of modern texts.

5. Intermediate Spanish (3) I, III, III. The Staff
Recitation—3 hours. Prerequisite: course 4. Continuation of course 4.

6. Introduction to Reading (3) I, II, III. The Staff
Recitation—3 hours. Prerequisite: course 4. Reading of selected Spanish texts to acquaint students with a variety of written styles. Exercises and tests will emphasize comprehension and will focus on particular problems of grammar and vocabulary.

7A-7B-7C. Grammar and Composition for Native Speakers (4-4-4) I-II-III. Rojas

Discussion—3 hours; compositions. Prerequisite: course 3 or the equivalent, or consent of instructor. Grammar and composition. Open to students whose native language is Spanish or to those who are bilingual though cannot be given to graduates of high schools where Spanish was the language of instruction. Open to majors and non-majors.

8A. Elementary Spanish Conversation (2) I, II, III. The Staff (Chairperson in charge)

Discussion—2 hours. Prerequisite: course 3; course 4 (concurrently) recommended. Directed group conversation including practical exercises in phonetics and language pronunciation. Vocabulary expansion and emphasis on grammatical accuracy. Limited enrollment. (P/NP grading only.)

8B. Elementary Spanish Conversation (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: course 4 or 8A; course 5 (concurrently) recommended. Continuation of course 8A. Limited enrollment. (P/NP grading only.)

9. Intermediate Spanish Conversation (2) I, II, III. The Staff (Chairperson in charge)

Discussion—2 hours. Prerequisite: course 5 or 8B; course 28 (concurrently) recommended. Directed group conversation with special emphasis on development of fluency in oral expression for the more advanced student. Limited enrollment. (P/NP grading only.)

28. Spanish Composition (4) I, II, III. The Staff
Discussion—3 hours; written assignments. Prerequisite: course 5. Development of writing skills through correct use of idiomatic expressions, practice in writing summaries and original compositions.

34. Mexico in Its Literature (3) II. Rojas
Lecture—3 hours. Introduction to significant literary trends in Mexican literature. Lectures and discussions in English, readings in either English or Spanish of representative works by major contemporary authors. May not be counted as part of the major or minor in Spanish.

35. Survey of Mexican Culture (3) III. Rojas
Lecture—3 hours. Indian cultural patterns before the discovery of Mexico; development of Mexican civilization during the Spanish conquest, the national period, and the Revolution of 1910. Conducted in English. May not be counted as part of the major or minor in Spanish.

50A. Hispanic Literary Heritage (3) I. Anderson
Lecture—3 hours. Major works in Spanish literature, from the Medieval Epic to the Golden Age, presented in English translations. Lectures and discussions in English. May not be counted as part of the major or minor in Spanish.

50B. Hispanic Literary Heritage (3) II. Scari
Lecture—3 hours. Major works in Spanish and Latin American literatures, from the nineteenth century to the present, presented in English. May not be counted as part of the major or minor in Spanish.

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.)

Upper Division Courses

103A-103B. Hispanic Literature I: Medieval and Golden Age (4-4) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours; written reports. Prerequisite: course 28 or 7C. Introduction to the study of the principal authors, works, and movements of Medieval and Golden Age literature of Spain, and of Spanish-American colonial literature.

104A. Hispanic Literature II: Modern Peninsular (4) II. The Staff (Chairperson in charge)
Lecture—3 hours; written reports. Prerequisite: course 28 or 7C. Introduction to the study of the principal authors, works, and movements of modern Spanish literature from 1700 to the present.

104B. Hispanic Literature II: Modern Peninsular (4) III. The Staff (Chairperson in charge)
Lecture—3 hours; written reports. Prerequisite: course 28 or 7C. Introduction to the study of the principal authors, works, and movements of modern Spanish literature from 1700 to the present. Continuation of course 104A.

105A. Hispanic Literature III: Modern Spanish American (4) I. The Staff
Lecture—3 hours; written reports. Prerequisite: course 28 or 7C. Introduction to the principal authors, works, and movements of Spanish-American literature of the nineteenth and twentieth centuries.

NOTE: For key to footnote symbols, see page 130.

- 105B. Hispanic Literature III: Modern Spanish American** (4) II. The Staff
Lecture—3 hours; written reports. Prerequisite: course 28 or 7C. Introduction to the principal authors, works, and movements of Spanish-American literature of the nineteenth and twentieth centuries. Continuation of course 105A.
- 106. Literature of Colonial Spanish America** (4) I, Castanien
Lecture—3 hours; conferences and reports. Prerequisite: course 28 or 7C. Study of the most important authors and movements in the various regions of Spanish America to 1810.
- 107. Spanish-American Literature of the Nineteenth Century** (4) II. Jaén
Lecture—3 hours; individual or group conferences. Prerequisite: course 28 or 7C. The literary development of Spanish America between independence and Modernismo. Modernismo.
- 108A. Spanish-American Prose of the Twentieth Century** (4) III.
Lecture—3 hours; conferences and reports. Prerequisite: course 28 or 7C. Emphasis on the development of the novel. Offered in odd-numbered years.
- 108B. Spanish-American Prose of the Twentieth Century** (4) III. Jaén
Lecture—3 hours; conferences and reports. Prerequisite: course 28 or 7C. Emphasis on the essay. Offered in even-numbered years.
- 109. Spanish Drama of the Golden Age** (4) III. Sánchez-Romeralo
Lecture—3 hours; conferences and reports. Prerequisite: course 28 or 7C. Offered in even-numbered years.
- 110A. Advanced Spanish Composition I** (4) I. The Staff
Discussion—3 hours; written reports. Prerequisite: course 28 or 7C. Practice in expository writing, with an aim toward refinement and expansion of vocabulary.
- 110B. Advanced Spanish Composition II** (4) II. The Staff
Discussion—3 hours; written reports. Prerequisite: course 28 or 7C. Practice in creative writing, with an aim toward refinement and appreciation of written expression and expansion of vocabulary.
- 110C. Advanced Spanish Composition III** (4) III. The Staff
Lecture—1 hour; discussion—2 hours; written reports. Prerequisite: course 28 or 7C. Practice in writing of critical essays based on textual analysis of selected works from Hispanic literature.
- 111. Don Quixote** (4) II. Castanien
Lecture—3 hours. Prerequisite: course 28 or 7C.
- 114. Spanish Romantic Literature** (4) I. Scari
Lecture—3 hours; conferences and reports. Prerequisite: course 28 or 7C. Readings and lectures on romantic writers of the first half of the nineteenth century with emphasis on drama and poetry. Offered in even-numbered years.
- 115. Lyric Poetry of the Golden Age** (4) III. Sánchez-Romeralo
Lecture—3 hours. Prerequisite: course 28 or 7C. Offered in odd-numbered years.
- 119. Spanish Novel of the Nineteenth Century** (4) III. Scari
Lecture—3 hours. Prerequisite: course 28 or 7C. Offered in odd-numbered years.
- 120A. Twentieth-Century Spanish Prose** (4) I, Anderson
Lecture—3 hours. Prerequisite: course 28 or 7C.
- 120B. Twentieth-Century Spanish Drama** (4) III. Anderson
Lecture—3 hours. Prerequisite: course 28 or 7C. Offered in odd-numbered years.
- 120C. Twentieth-Century Spanish Poetry** (4) III. Anderson, Sánchez-Romeralo
Lecture—3 hours. Prerequisite: course 28 or 7C. Offered in even-numbered years.
- 124. Chicano Culture** (4) I, Rojas
Lecture—3 hours; term paper. Prerequisite: course 2 or consent of instructor. Study of Chicano culture in the Southwest from 1598 to the present, emphasis on the period after 1848. Lectures and discussions in English; readings in English and/or Spanish. May not be counted as part of major in Spanish. Offered in odd-numbered years.
- 125A. Modernism: The Precursors** (4) I.
Lecture—3 hours. Prerequisite: course 28 or 7C. Offered in even-numbered years.
- 125B. Modernism: The Major Poets** (4) II.
Lecture—3 hours. Prerequisite: course 28 or 7C. Offered in even-numbered years.
- 126. Chicano Literature** (4) I, Rojas
Lecture—3 hours; term paper. Prerequisite: course 2 or consent of instructor. Analysis and interpretation of repre-

sentative works in poetry, prose fiction, essay and drama. Lectures and discussion in English. Readings in English and/or Spanish. May not be counted as part of the major in Spanish. Offered in even-numbered years.

- 127. Poetry of Post-Modernism and Vanguardism** (4) III. Verani
Lecture—3 hours; conferences. Prerequisite: course 28 or 7C. Offered in even-numbered years.
- 128. Contemporary Spanish-American Short Story Writers** (4) II.
Lecture—3 hours; conferences and reports. Prerequisite: course 28 or 7C. Literary trends in the development of the short story in Spanish America as seen in the representative works of major contemporary authors. Offered in even-numbered years.
- 129. The Mexican Novel** (4) III. Rojas
Lecture—3 hours; conferences and reports. Prerequisite: course 28 or 7C or consent of instructor. Major figures in the development of the Mexican novel. Offered in odd-numbered years.
- 131. Modern Spanish Syntax** (4) I, Keller
Lecture—3 hours; conferences and reports. Prerequisite: course 28 or 7C or consent of instructor. Study of word relationships in European and American Spanish, with special attention to syntax of verbs.
- 132. Introduction to Spanish Linguistics** (3) III. Torreblanca
Lecture—3 hours. Prerequisite: course 28 or 7C or consent of instructor. Principles of classical phonemics and morphemics together with more recent developments; descriptive analysis of modern Spanish sounds and forms. Theoretical and practical comparison with English and other Romance Languages.
- 133. Spanish Phonetics** (3) I, II. Torreblanca
Lecture—3 hours. Prerequisite: course 28 or 7C or consent of instructor. The sound structure of modern Spanish; theoretical analysis of selected problems in pronunciation. Strongly recommended for prospective teachers.
- 134. Survey of Spanish Culture** (4) I, González
Lecture—3 hours. Prerequisite: course 28 or 7C or consent of instructor.
- 135. Survey of Mexican Culture** (4) II. Rojas
Lecture—3 hours; conferences and reports. Prerequisite: course 28 or 7C or consent of instructor. (Offered in even-numbered years.)
- 136. Survey of Spanish-American Culture** (4) II. The Staff (Chairperson in charge)
Lecture—3 hours; term paper. Prerequisite: course 28 or 7C. Major developments in the arts and social institutions of Spanish-American areas other than Mexico. Readings, lectures and discussions in Spanish.
- 138. Contemporary Spanish-American Drama** (4) II. Keller
Lecture—3 hours; conferences and reports. Prerequisite: course 28 or 7C. Study of major authors, significant trends, as well as origins and development of the genre.
- 149. Order and Chaos: Latin-American Literature in Translation** (4) I, Jaén
Lecture—3 hours; conferences and reports. 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.
- 150. Masterpieces of Spanish Literature** (4) I, Scari
Lecture—3 hours. Reading, lectures, and discussion in English. May not be counted as part of the major in Spanish.
- 151. Study of a Major Writer** (4) I, II, III. The Staff
Lecture—3 hours. Prerequisite: course 28 or 7C. May be repeated for credit with consent of instructor.
- 175. Introduction to Literary Theory and Criticism** (4) II. Jaén
Lecture—3 hours; conferences. Prerequisite: course 28 or 7C. Basic concepts for the analysis of literature with emphasis on Spanish literary and critical theory applied to Spanish literature.
- 192I. Internship in Spanish** (1-4) I, II, III. The Staff (Chairperson in charge)
Field work. Prerequisite: course 28 or 7C; junior standing; major in Spanish, Mexican-American (Chicano) studies, or a related field. Internships in fields where Spanish language skills can be used and perfected (teaching, counseling, translating-interpreting, etc.). May be repeated for credit for a total of 8 units. Units will not count toward the Spanish major. (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

- 200. Techniques of Literary Scholarship** (4) III. Castanien
Seminar—3 hours. Elements of bibliography and fundamental methods of literary research. (S/U grading only.)
- 209. Literary Theory and Criticism: Prose Fiction** (4) III. Verani
Seminar—3 hours. Study of contemporary literary theories and their application to twentieth-century Spanish American prose fiction.
- 210. Literary Criticism: Poetry** (4) I.
Seminar—3 hours. Offered in odd-numbered years.
- 220A. History of the Spanish Language** (4) I, Torreblanca
Seminar—3 hours. Prerequisite: Latin 1.
- 220B. History of the Spanish Language** (4) II. Torreblanca
Seminar—3 hours. Prerequisite: Latin 1.
- 221. Hispanic Dialectology** (4) III. Torreblanca
Seminar—3 hours. Study of the main genres of the Spanish Medieval period. Emphasis on the essential characteristics of medieval literature with attention given to at least one representative work of each genre. Offered in odd-numbered years.
- 229. Spanish Literature of the Early Renaissance** (4) I, Castanien
Seminar—3 hours. Spanish literature, 1450-1550, with emphasis on *La Celestina*.
- 231A. Spanish Literature of the Golden Age: Lyric Poetry** (4) I, Sánchez-Romeralo
Seminar—3 hours. Sixteenth-century currents in Spanish poetry. Offered in odd-numbered years.
- 231B. Spanish Literature of the Golden Age: Lyric Poetry** (4) II. Sánchez-Romeralo
Seminar—3 hours. Seventeenth-century currents in Spanish poetry. Offered in even-numbered years.
- 231C. Spanish Literature of the Golden Age: Prose Non-Fiction** (4) II. Castanien
Seminar—3 hours. Offered in odd-numbered years.
- 231D. Spanish Literature of the Golden Age: Prose Fiction** (4) II. Castanien
Seminar—3 hours. Offered in even-numbered years.
- 231E. Spanish Literature of the Golden Age: The Drama** (4) II. Sánchez-Romeralo
Seminar—3 hours. Offered in odd-numbered years.
- 232. Cervantes** (4) I, Castanien
Seminar—3 hours. The major works of Cervantes and of the principal Cervantine critics. Offered in odd-numbered years.
- 234A. Twentieth-Century Spanish Poetry** (4) I, Sánchez-Romeralo
Seminar—3 hours. From 1898 up to the Generation of 1927.
- 234B. Twentieth-Century Spanish Poetry** (4) II. Sánchez-Romeralo
Seminar—3 hours. New trends in Spanish poetry from 1927 to the present.
- 235A. Twentieth-Century Spanish Prose** (4) I, Anderson
Seminar—3 hours. Offered in odd-numbered years.
- 235B. Twentieth-Century Spanish Prose** (4) II. Anderson
Seminar—3 hours. Offered in even-numbered years.
- 236. Twentieth-Century Spanish Thinkers** (4) III. Scari
Seminar—3 hours. Major thinkers from Ganiivet to Unamuno and Ortega y Gasset. Emphasis will be placed on the relationships between Spanish thought and European philosophical currents. Offered in even-numbered years.
- 237. Twentieth-Century Spanish Drama** (4) I, Anderson
Seminar—3 hours. Major Spanish dramatists from Valle-Inclán to the present.
- 238. Spanish Romanticism** (4) I, Scari
Seminar—3 hours. Sources and development of Romanticism in Spain, particularly in poetry and drama.
- 239. Post-Romantic Spanish Literature of the Nineteenth Century** (4) II.
Seminar—3 hours. Offered in even-numbered years.
- 240A. Spanish-American Drama: 1880-1930** (4) III. Keller
Seminar—3 hours.
- 240B. Spanish-American Drama: 1930 to Present** (4) III. Keller
Seminar—3 hours.

- 241A. Spanish-American Novel, 1900-1920** (4) I.
Seminar—3 hours. Offered in even-numbered years.
- 241B. Spanish-American Novel, 1920-1940** (4) II.
Seminar—3 hours. Offered in odd-numbered years.
- 242. New Trends in Spanish-American Fiction from 1940 to the Present** (4) III.
Seminar—3 hours. Offered in odd-numbered years.
- 243. Spanish-American Short Story** (4) III. Jaén
Seminar—3 hours. Works by major writers, with emphasis on twentieth-century authors such as Quiroga, Borges, García Márquez, Cortázar, and Rulfo.
- 244. The Precursors of Spanish-American Modernism** (4) I.
Seminar—3 hours. Special study of the forerunners of *Modernismo*. Emphasis on the works of Martí, Diaz-Miron, Gutiérrez-Nájera, Casal and Silva.
- 245. Dario and His Contemporaries** (4) II.
Seminar—3 hours. Offered in even-numbered years.
- 247. New Directions in Spanish-American Poetry** (4) III. Verani
Seminar—3 hours. Offered in even-numbered years.
- 248. The Spanish-American Essay** (4) II. Jaén
Seminar—3 hours. Major Spanish-American essayists from Sarmiento to Octavio Paz. Offered in odd-numbered years.
- 251. Study of a Major Writer** (4) I, II, III. The Staff
Seminar—3 hours. The development of one major writer and his intellectual and literary milieu. May be repeated for credit with consent of instructor.
- 299. Research** (2-5) 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.
- 390A. Problems in Teaching Spanish at College Level** (3) I, Samaniego
Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing. Theoretical instruction in modern teaching methods and demonstration of their practical application. Required of graduate teaching assistants.
- 390B. Problems in Teaching Spanish at College Level** (1) III. Samaniego
Discussion—1 hour. Prerequisite: graduate standing. Theoretical instruction in modern teaching methods and demonstration of their practical application. Intended primarily for graduate teaching assistants.

Statistics

(Intercollege Division)

Julius R. Blum, Ph.D., Chairperson of the Division and Associate Dean of Statistics
Division Office, 469 Kerr Hall (752-2361)

Faculty

- Julius R. Blum, Ph.D., Professor
Alan P. Fenech, Ph.D., Associate Professor
Charles E. Franti, Ph.D., Professor (*Statistics, Community Health*)
Wesley O. Johnson, Ph.D., Assistant Professor
Norman S. Matloff, Ph.D., Assistant Professor
Francisco J. Samaniego, Ph.D., Associate Professor
Jessica M. Utts, Ph.D., Assistant Professor
Alvin D. Wiggins, Ph.D., Associate Professor

Statistics is a subject which touches our lives virtually every day in a variety of ways, from the amount we pay for insurance to the television shows which are left on the air. It has been developed to enable us to make inferences about entire populations, based on samples extracted from those populations. Thus, statistical methods can be applied to problems from almost every dis-

cipline and they are vitally important to researchers in agricultural, social, engineering, and medical sciences.

The Division of Statistics offers courses to fulfill needs at all levels. A minor in statistics gives the student a basic grounding in both theory and applications and would be a valuable complement to almost any major program. An undergraduate major in statistics is sufficient preparation for either a career or graduate study in the field.

The first statistics course a student takes will depend on both background and motivation. The most elementary courses require no mathematics beyond high school algebra, and are designed to acquaint students with the basic ideas and techniques of probability and statistics. The upper-division entry-level courses, Statistics 130 and 131, which have calculus as a prerequisite, cover statistical techniques along with the probabilistic motivation and theory from which they are derived. Other courses focus on varied aspects of statistical theory, data analysis and statistical computing.

The Major Programs

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. The Bureau of Labor Statistics has estimated that the demand for trained statisticians in government and industry will exceed the supply by at least 1,500 through the year 1985. 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.

The major programs in statistics are designed to make possible a wide variety of career choices. The Bachelor of Arts degree is very flexible, facilitating a double major or extensive elective coursework in a field in which statistics is applied. The Bachelor of Science degree places a stronger emphasis on mathematics, and is especially recommended for students who may pursue graduate work in statistics. Both programs require theoretical and applied coursework and emphasize the strong interdependence of statistical theory and the applications of statistics.

The concurrent study of statistics and a field of applications at an advanced level will serve students well either in preparing for a career in an area of application or in preparing for graduate study. Students with a strong interest in a quantitative discipline are encouraged to pursue a double major combining statistics and this discipline. Computers play a vital role in statistical applications, and advanced courses in computer programming are strongly recommended.

Students who wish to pursue a joint statistics/computer science degree may wish to explore the University's individual major option (see page 231). For details, contact a statistics undergraduate major adviser.

Statistics

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24
Calculus, Mathematics 21A, 21B, 21C	12
Linear algebra, differential equations, Mathematics 22A, 22B	6
Computer science, Engineering 5 or Mathematics 29	3
Statistics through computers, Statistics 32	3

Depth Subject Matter	36-37
Analysis of variance, multiple regression, Statistics 106, 108 or the equivalent	7
Probability and mathematical statistics, Statistics 131A, 131B, 131C	12
Three Statistics courses with Statistics 131 as a prerequisite	8-9
Related elective courses	9
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 Major 60-61

Statistics

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	24
Calculus, Mathematics, 21A, 21B, 21C	12
Linear algebra; differential equations, Mathematics 22A, 22B	6
Computer science, Mathematics 29 or Engineering 5	3
Statistics through computers, Statistics 32	3

Depth Subject Matter	48-51
Analysis of variance, multiple regression, Statistics 106, 108 or the equivalent	7
Introduction to probability, mathematical statistics, Statistics 131A, 131B, 131C or the equivalent	12
Four Statistics courses having Statistics 131 as a prerequisite	11-12
Linear algebra, Mathematics 167	3
Three upper division Mathematics courses selected from 108A, 127A-127B-127C, 128A-128B-128C, 168. (Mathematics 127 strongly recommended for students considering graduate work in Mathematics or Statistics.)	9-11
Related elective courses	6
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 Major 72-75

Designing a Program. Sometime before or during the first quarter of the junior year each student planning to major in statistics should consult with a faculty adviser to plan the remainder of his or her undergraduate program. Students are encouraged to meet with an adviser to design a program as early as possible.

Major Advisers. A.P. Fenech.

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
Statistics	18
Statistics 106, 108, and 130A-130B or 131A-131B	15
One course in Statistics having Statistics 130B or 131B as a prerequisite	3
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. F.J. Samaniego.

Statistical Consulting. The Division provides a consulting service for researchers on campus. For more information, call the Statistical Laboratory Office or the Division Office.

NOTE: For key to footnote symbols, see page 130

Courses in Statistics

Lower Division Courses

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 even-numbered 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 having had courses 130A or 131A may not take course 13 for credit.)

32. Basic Statistical Analysis Through Computers (3) II. The Staff
Lecture—3 hours. Prerequisite: Mathematics 16B or 21B, 19, 29, or Engineering 5. Introduction to modern statistical thinking using student-developed digital computer algorithms. Simulation and approximation methods. Sampling. Robust estimation and hypothesis testing. Association methods: regression, correlation, and contingency tables.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Special topics in statistics appropriate for study at the lower division level. (P/NP grading only.)

Upper Division Courses

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 pre-calculus 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.

104. Applied Statistical Methods: Nonparametric Statistics (3) II. The Staff
Lecture—3 hours. Prerequisite: course 13 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 even numbered years.

106. Applied Statistical Methods: Analysis of Variance (4) II, III. The Staff
Lecture—4 hours. Prerequisite: course 13 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 (3) I. The Staff
Lecture—3 hours. Prerequisite: course 13 or 102. Simple linear regression, multiple regression, variable selection techniques, stepwise regression, analysis of covariance.

110. Applied Statistical Methods: Multivariate Analysis (3) I. The Staff
Lecture—3 hours. Prerequisite: courses 13 or 102, and 106 or 108. Estimation of the mean vector and covariance matrix of a multivariate population. Multiple comparisons methods. Estimation of simple, multiple and partial correlation coefficients. One-way MANOVA. Linear discriminant functions. Principle component analysis. Factor analysis. Offered in odd-numbered years.

130A-130B. Mathematical Statistics, Brief Course (4-4) I-II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16B. Course in mathematical statistics for non-majors. Concepts of probability and sampling, principles of estimation, properties of estimators, sampling distributions, bivariate normal and principles of testing.

131A. Introduction to Probability Theory (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 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.

131B-131C. Introduction to Mathematical Statistics (4-4) II-III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 131A. Sampling, point estimation, exact sampling distributions, confidence intervals, hypothesis testing, linear regression and analysis of variance.

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 odd-numbered years.

135. Multivariate Data Analysis (3) III. The Staff
Lecture—3 hours. Prerequisite: course 130B or 131B. Quantitative description and analysis of social and biological problems. Multivariate statistical procedures implemented through computer methods. Applied time series, factor and cluster analysis.

141. Statistical Computing (2) I. The Staff
Lecture—2 hours. Prerequisite: an elementary course in computer programming, and either course 131B or 130B, or consent of instructor. Monte Carlo simulation; numerical methods for nonlinear estimation; computational techniques for linear models; comparison of packaged computer programs. Offered in odd-numbered years.

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 odd-numbered years.

144. Sampling Theory of Surveys (3) II. 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 even-numbered years.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Special topics in statistics appropriate for study at the upper division level. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Special topics in statistics appropriate for study at the upper division level. (P/NP grading only.)

Graduate Courses

205. Statistical Methods for Research (3) III. The Staff
Lecture—3 hours. Prerequisite: course 106 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.

231A-231B-231C. Mathematical Statistics (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 131C. Distribution theory, decision theoretic methods, estimation and hypothesis testing, multivariate techniques, large sample theory.

232A-232B. Linear Model Theory (3-3) I-II. The Staff
Lecture—3 hours. Prerequisite: course 131C. Estimation and testing for the general linear hypothesis, components of variance, multiple comparisons. Offered in even-numbered years.

233. Design of Experiments (3) III. The Staff
Lecture—3 hours. Prerequisite: course 131C. Topics from balanced and partially balanced incomplete block designs, fractional factorials, and response surfaces. Offered in odd-numbered years.

234. Advanced Regression Analysis (3) III. The Staff
Lecture—3 hours. Prerequisite: course 131C or 130B, 108, or consent of instructor. Techniques of variable selection. Problems of multicollinearity. Nonlinear regression. Special topics. Offered in even-numbered years.

236A-236B-236C. Advanced Mathematical Statistics (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 231C. Statistical theory of invariance, robustness, sequential analysis, nonparametric theory. Offered in odd-numbered years.

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.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Special topics in statistics appropriate for study at the graduate level.

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Special topics in statistics appropriate for study at the graduate level. (S/U grading only.)

Subject A

See under University Requirements, page 60; or English A course, page 196

Surgery

(School of Veterinary Medicine)

Eugene P. Steffey, V.M.D., Ph.D., Chairperson of the Department

Department Office, 2112 Medical Science 1A
(752-3599)

Faculty

Cleta S. Bailey, D.V.M., Ph.D., Assistant Professor
Eugene M. Breznock, D.V.M., Ph.D., Associate Professor
Murray P. Brown, D.V.M., Assistant Professor
Ned Buyukmihci, V.M.D., Assistant Professor
Robert M. Cello, D.V.M., Professor
I. M. Gourley, D.V.M., Ph.D., Professor
Steve C. Haskins, D.V.M., M.S., Assistant Professor
Terrell A. Holliday, D.V.M., Ph.D., Professor
Andrew B. Kelly, Jr., D.V.M., Assistant Professor
Robert L. Leighton, V.M.D., Professor
Bruce R. Madewell, D.V.M., Associate Professor
Susan V. Manley, D.V.M., Assistant Professor
Dennis M. Meagher, D.V.M., Ph.D., Professor
Harold R. Parker, D.V.M., Ph.D., Professor
Harold D. Snow, D.V.M., Associate Adjunct Professor (School of Medicine, Los Angeles campus)
Eugene P. Steffey, V.M.D., Ph.D., Professor
Gordon H. Theilen, D.V.M., Professor
Philip Vasseur, D.V.M., Assistant Professor
John D. Wheat, D.V.M., Professor
Alida P. Wind, D.V.M., Lecturer

Part-Time Clinical Faculty

Gregory Ferraro, D.V.M., Assistant Clinical Professor
Alan D. MacMillan, D.V.M., Ph.D., Assistant Clinical Professor
Charles T. Robinson, D.V.M., Assistant Clinical Professor
Randall H. Scaggiotti, D.V.M., Assistant Clinical Professor

Courses in Surgery

Upper Division Course

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Wheat in charge)
(P/NP grading only.)

Graduate Courses

206. Clinical Oncology (3) II. Theilen, Ling
Lecture—2 hours; rounds—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. A study of neoplastic diseases of animals.

226. Veterinary Anesthesiology (1) II. Haskins
Lecture—1 hour; demonstrations. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Advanced course in veterinary anesthesia emphasizing patient management and anesthesia for specific diseases and surgical procedures. Discussions will include the relation between pathophysiology and the aspects of anesthesia, preoperative preparation; and particular species requirements including laboratory animals.

228. Anesthesia in Research (1) III. Steffey
Lecture—1 hour. Prerequisite: graduate of professional student, or consent of instructor. Lecture series offered by the School of Veterinary Medicine directed at graduate and professional students interested in broadening their knowledge of the principles of anesthesia as related to biomedical research.

298. Group Study (1-5) I, II, III. The Staff (Wheat in charge)

299. Research (1-12) I, II, III. The Staff (S/U grading only.)

Professional Courses

410. Small Animal Surgery (1½ per week) I, II, III. The Staff (Leighton in charge)
Laboratory—50 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns responsible for preoperative preparation of hospital patients, assistance at operating and post-operative care under the supervision of the senior surgical staff. Provides experience in orthopedic and general surgery in small animals. May be repeated for credit. (S/U grading only.)

411. Surgery (1½ per week) I, II, III. The Staff (Leighton in charge)
Laboratory—50 hours. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents 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 (1½ per week) I, II, III. The Staff (Wheat in charge)
Laboratory—50 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns 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.)

414. Veterinary Anesthesiology (1½ per week) I, II, III. The Staff (Steffey in charge)
Laboratory—50 hours. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, or consent of instructor. Interns 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.)

420. Veterinary Neurology (1½ per week) I, II, III. Holliday
Laboratory—50 hours. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, or consent of instructor. Interns and residents 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 (¾ to 1½ per week) I, II, III. Ceilo
Laboratory—25-50 hours. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, or consent of instructor. Interns and residents responsible for the care of animals in the hospital and outpatient 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.)

492. Large Animal Grand Rounds (½) I, II, III. The Staff (Wheat in charge)
Discussion—1 hour. Prerequisite: professional standing; intern or resident in Veterinary Medical Teaching Hospital or

consent of instructor. Interns and residents take an active part in the presentation and discussion of selected cases from the large animal and ambulatory clinics. (S/U grading only.)

Swedish

See Scandinavian

Textiles and Clothing

(College of Agricultural and Environmental Sciences)

S. Haig Zeronian, Ph.D., Chairperson of the Division

Division Office, 129 Everson Hall (752-6650)

Faculty

Cheryllynn M. Carrie, Ph. D., Lecturer
Emory Menefee, Ph.D., Adjunct Professor
Mary Ann Morris, Ph.D., Professor
Howard L. Needles, Ph.D., Professor
Allen G. Pittman, Ph.D., Adjunct Professor
Margaret H. Rucker, Ph.D., Assistant Professor
Howard G. Schutz, Ph.D., Professor
S. Haig Zeronian, Ph.D., Professor

The Major Program

The Textiles and Clothing major is concerned with the study of the socioeconomic and physical science aspects of textiles and clothing including physical and chemical properties, applications, structure, and care of fibers and fabrics, and their production and end-use. All students in the major are required to take a common core of preparatory subject matter balanced between the social sciences-humanities and physical sciences and depth subject matter in textiles and clothing as well as in business. The student is expected to have a particular area of emphasis in textiles through careful selection of restricted electives in consultation with an adviser. This major prepares you for a career in textiles and clothing and related fields including merchandising and marketing, production, testing, quality control, technical service, textile journalism, and design. Those interested in careers in extension service and teaching should consult with their adviser. Graduates are qualified to enter the graduate program in Textiles, and Textiles and Clothing or Textile Science programs at other universities.

Textiles and Clothing

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
Preparatory Subject Matter†	74-76
Cultural anthropology (Anthropology 2)	4
Introductory psychology (Psychology 1)	4
Sociology (Sociology 1)	5
Economics, including general principles and accounting (Economics 1A-1B, 11A-11B)	17
Written expression, two courses (see College requirement)	8
Oral expression, one course (see College requirement)	4
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
Statistics, one course (Statistics 13 or Economics 12)	4-5
Physics (Physics 1A, 1B)	6
Computer science (Mathematics 19)	3
History of art or design, one course	3-4
Depth Subject Matter	45
Textiles and Clothing 6, 7	7
Textiles courses selected from: Textiles and Clothing 17A, 17B, 161-161L, 162-162L, 163-163L, 164, 165, 172, 180A, 180B	22
Agricultural Economics 18, 112, 113	12
Design 143	4
Restricted Electives	25
Courses selected from the following:	
Agricultural Economics 114, 117, 155, 171A, 171B; Agricultural Science and Management 150; Applied Behavioral Sciences 162; Consumer Science 100; Consumer Economics 141 or 141M, 142; Design 142A, 142B, 170A, 170B, 170C; Economics 100, 101, 121A, 121B, 134; Mathematics 16A, 16B, 16C; Psychology 145; Rhetoric 42, 140; Sociology 25, 123, 126, 140, 148, 159, 175; Statistics 106, 108; Textiles and Clothing 47, 90 and courses not taken under Depth Subject Matter above.	
Unrestricted Electives	34-36
Total Units for the Major	180

Major Adviser. H.L. Needles.

Graduate Study. A program of study is offered leading to the M.S. degree in Textiles. Information can be obtained from the graduate adviser. Also see page 99.

Related Courses. See courses in Consumer Science and Design.

Courses in Textiles and Clothing

Questions pertaining to the following courses should be directed to the instructor or to the Division of Textiles and Clothing.

(Note — Each course is listed under one of three groups: a. *Clothing*; b. *Textiles*; c. *Field, Group, and Special Study*.)

a) Clothing

7. Social and Psychological Aspects of Dress (3) I, III. Carrie
Lecture—3 hours. Prerequisite: introductory courses in anthropology, sociology and/or psychology recommended. A study of dress in relation to culture, society and the individual.

17A. Clothing Structure (4) I, II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: clothing construction skills; courses 6 and 7 recommended. Principles of clothing design through the medium of drafting and flat pattern. Construction principles are applied.

17B. Clothing Structure (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 17A. Principles of clothing design through the medium of draping in various textile fabrics.

172. The Textile and Apparel Industries (3) I, Rucker
Lecture—3 hours. Prerequisite: courses 6, 7; an introductory course in economics (1A or 1B). A study of the clothing industry including the production, distribution and consumption of textile goods.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Textile Science; Vegetable Crops

b) Textiles

6. Introduction to Textiles (4) I, Morris

Lecture—3 hours; laboratory—3 hours. Introduction to the structure and properties of textiles. Consumer use and fabric characteristics are emphasized.

100. Principles of Polymer Materials Science (3) III. Needles, Zeronian

Lecture—3 hours. Prerequisite: Chemistry 1A-1B or 4A-4B, 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.

161. Structure and Properties of Fibers (3) I, Zeronian

Lecture—3 hours. Prerequisite: course 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.

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.

162. Textile Fabrics (3) II, Morris

Lecture—3 hours. Prerequisite: course 6. Properties of fabrics as related to serviceability, comfort, and appearance.

162L. Textile Fabrics Laboratory (1) II, Morris

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, Chemistry 8B, Physics 1B. Basic principles of dyeing, printing, and finishing of textiles; color theory, structure and properties of dyes and finishes; the effect of variables and auxiliaries on dyeing, printing, and finishing; dye and finish fixation and fastness.

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

Lecture—3 hours. Prerequisite: course 17B, Agricultural Economics 113. Overview of research, theoretical basis, technology and processes in the apparel manufacturing industries including study of product engineering, materials utilization and fabrications, management controls, mechanization, production engineering.

165. Principles of Textile Processes (3) II, Needles

Lecture—3 hours. Prerequisite: course 6, Chemistry 8B, Physics 1B. Explores the physical and chemical processes involved in production of textiles from the individual fiber to the finished fabric. Includes polymerization, spinning, texturing, yarn formation, weaving preparation, weaving and knitting, non-wovens, tufting, scouring, bleaching, and physical/chemical finishing.

210. Textile Physical and Chemical Processes (3) III, Needles

Lecture—3 hours. Prerequisite: courses 6, 161, organic chemistry (Chemistry 8A, 8B); or consent of instructor. Theoretical aspects of physical and chemical treatment of textile fiber yarns and fabrics. Textile pre- and post-treatment, physical processing, chemical finishing, and dyeing. Effect of processes on textile and end-use properties and on the environment. Offered in odd-numbered years.

***220. Textile Product Quality and Standards (3) II, Zeronian**
Lecture—3 hours. Prerequisite: course 161. Principles involved in establishing standards for implementation of government laws and regulations concerning textiles and clothing and quality controls for textile products. Offered in even-numbered years.

230. Behavioral Science Concepts in Textiles (3) II, Rucker

Lecture—3 hours. Prerequisite: course 7, upper division or graduate course in statistics (e.g., Agricultural Science and Management 150) and one in a behavioral science (e.g., Psychology 145); or consent of instructor. An examination of theories and research concerning relationship between clothing and human behavior with emphasis on research techniques, including methods of measuring clothing variables.

260. Recent Advances in Textiles (2) III, Zeronian

Lecture—2 hours. Prerequisite: course 161 or consent of

instructor. Critical reading and evaluation on selected topics of current interest in textiles. May be repeated for credit.

c) Field, Group, and Special Studies

47. Field Study (1) III, The Staff

Seminar—two 2-hour sessions; field trip—2 days. Prerequisite: consent of instructor; registration in advance required. Field trip to observe commercial aspect of the design, production, development, distribution and maintenance of textiles and clothing. To be given between winter and spring quarters. Considered a spring course for pre-enrollment. (P/NP grading only.)

90. Challenges and Opportunities in Textiles and Clothing (1) III, The Staff

Seminar—1 hour. One hour seminar per week at which specialists in selected areas of textiles and clothing survey their part in today's industry, indicating challenges, opportunities and prospects for the appropriately trained university graduate. May be repeated for credit. (P/NP grading only.)

92. Internship in Textiles and Clothing (1-12) I, II, III, The Staff (Zeronian in charge)

Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience off campus in a textiles or clothing-related area. Supervision by a member of the Textiles and Clothing faculty. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III, The Staff (Zeronian in charge)

(P/NP grading only.)

180A-180B. Introduction to Research in Textiles and Clothing (2-2) I, II, III, The Staff

Prerequisite: textile major of senior standing. Senior thesis on independent problems. The research begun in 180A will be continued and completed in 180B. (Deferred grading only, pending completion of sequence.)

192. Internship in Textiles and Clothing (1-12) I, II, III, The Staff (Zeronian in charge)

Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn 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 (Chairperson in charge)

Discussion-Laboratory—3-15 hours. Prerequisite: upper division textiles-related major and consent of instructor. Tutoring of students in Textiles and Clothing 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 (Zeronian in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, The Staff (Zeronian in charge)

(P/NP grading only.)

290. Seminar (1) I, II, Zeronian

Seminar—1 hour. Critical review of selected topics of current interest in textiles. (S/U grading only.)

298. Group Study (1-5) I, II, III, The Staff (Zeronian in charge)

(S/U grading only.)

299. Research (1-12) I, II, III, The Staff (Zeronian in charge)

(S/U grading only.)

ter in textile science, statistics, and technical writing. The student is expected to emphasize a particular aspect such as physical sciences, mathematics, economics, or textiles and clothing through selection of appropriate restricted electives in consultation with an adviser. The major prepares the student for a career in textiles or fiber science and other polymer-related areas including research and development, technical service, technical marketing, production, quality control, and science teaching (on completion of an additional year in the teaching credential program). Graduates are prepared to enter the graduate program in Textiles or Agricultural and Environmental Chemistry with a specialization in Textile Chemistry, and Textile Science or Fiber and Polymer Science programs at other universities.

Textile Science

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
Preparatory Subject Matter	85-88
Chemistry, including organic and analytical: Chemistry 1A, 1B, 1C, 5, 128A, 128B, 128C, 129A	30
Mathematics, including calculus, statistics, computers (Mathematics 16A-16B-16C or 21A-21B-21C, 19 or 29 Statistics 13)	16-19
Physics (Physics 2A, 2B, 2C)	9
Economics (Economics 1A-1B)	10
Written and oral expression (see College requirement, page 70)	8
Social sciences or humanities electives†	12
Depth Subject Matter	30
Textiles and Clothing 6, 161-161L, 162-162L, 163-163L, 165, 180A, 180B	23
Agricultural Science and Management 150	4
English 104	3
Restricted Electives	25
Select courses from the following: Agricultural Economics 18, 112, 113, 117, 171A, 171B; Biological Sciences 1; Bacteriology 2, 3; Chemistry 107A, 107B, 108 or 110A, 110B, 110C, 121, 130; Economics 11A, 11B, 100, 101, 121A, 121B, 134; Mathematics 22A, 22B, 32; Physics 3A, 3B, 3C; Statistics 32, 106, 108; Textiles and Clothing 7, 17A, 17B, 47, 90, 164, 172.	
Unrestricted Electives	37-40
Total Units for the Major	180

Major Adviser. H. L. Needles (*Textiles and Clothing*).

Graduate Study. A program of study is offered leading to the M.S. degree in Textiles. Information can be obtained from the graduate adviser. Also see page 99.

Textile Science

(College of Agricultural and Environmental Sciences)

The Major Program

The Textile Science major is concerned with the physical, chemical, and structural properties of fibers and fabrics, textile dyeing and finishing, polymer science and the relation of these aspects to fiber and fabric performance and end-use. All students in this major are required to take a common core of coursework in chemistry, physics, and mathematics coupled with selected social sciences-humanities courses, and depth subject mat-

Vegetable Crops

(College of Agricultural and Environmental Sciences)

Lawrence Rappaport, Ph.D., Chairperson of the Department

Department Office, 152 Hunt Hall (752-0516)

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Faculty

James F. Harrington, Ph.D., Professor
 Frederick D. Howard, Ph.D., Senior Lecturer
 Richard A. Jones, Ph.D., Assistant Professor
 Oscar A. Lorenz, Ph.D., Professor
 James M. Lyons, Ph.D., Professor
 John H. MacGillivray, Ph.D., Professor Emeritus
 Leonard L. Morris, Ph.D., Professor
 Thomas J. Orton, Ph.D., Assistant Professor
 Harlan K. Pratt, Ph.D., Professor
 Lawrence Rappaport, Ph.D., Professor
 Charles M. Rick, Ph.D., Professor
 Vincent Rubatzky, Ph.D., Lecturer
 W.L. Sims, Ph.D., Lecturer
 Paul G. Smith, Ph.D., Professor Emeritus
 Arthur R. Spurr, Ph.D., Professor
 M. Allen Stevens, Ph.D., Adjunct Professor
 Herman Timm, Ph.D., Lecturer
 James E. Welch, Ph.D., Lecturer Emeritus
 Masatoshi Yamaguchi, Ph.D., Professor
 Shang Fa Yang, Ph.D., Professor

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 page 99.

Graduate Adviser. A.R. Spurr.

Related Courses. See Plant Science 1, 2, 101, 102, 112, 112L, 113, 121A-121B-121C.

Courses in Vegetable Crops

Questions pertaining to the following courses should be directed to the instructor or to the Academic Advising Center, 122 Hoagland Hall.

Lower Division Course

92. Internship in Vegetable Crops (1-6) I, II, III. The Staff (Department Chairperson in charge)
 Laboratory—3-36 hours. Work-learn 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

101. Principles of Vegetable Crops Production (4) II. Lyons
 Lecture—3 hours; discussion—1 hour. Prerequisite: Botany 2 and/or Plant Science 2. Fundamentals of vegetable crop production, handling, processing, utilization and distribution.

105. Systematic Olericulture (2) I. Rubatzky
 Laboratory—6 hours. Prerequisite: Botany 2. Origin, history, types, classification, nomenclature, and adaptation of the more important American vegetable varieties; minor vegetable crops; trends in development of new varieties.

118. Seed Physiology and Production (3) II. The Staff
 Lecture—3 hours. Prerequisite: Botany 111B. Physiological factors affecting germination of seeds, seed development, viability and longevity of seed. Principles of seed production. One or more field trips.

130. Mushrooms of California (3) I, II. Howard
 Lecture—2 hours; discussion—1 hour; laboratory—2 hours; field trips. Prerequisite: upper-division standing and/or consent of instructor. Introduction to the culture, food value and culinary aspects of market mushrooms and techniques of identification of wild mushrooms. Oral and written reports and a final examination form the basis for grading.

150. Vegetables as World Food Crops (3) III. Spurr
 Lecture—3 hours. Prerequisite: upper division standing or consent of instructor. A technical course concerned with historical and current aspects of production and use of vegetables as human food; ecology, economics, geography, human cultural patterns, dietary preferences, nutritional values, and use of microclimates related to commercial and subsistence production.

192. Internship in Vegetable Crops (1-12) I, II, III. The Staff (Department Chairperson in charge)
 Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn 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.)

197. Field Study of Vegetable Industry (1) III. Rubatzky
 Lecture—1 hour; field study—56 hours. Prerequisite: consent of instructor. Field study illustrating different aspects of California agriculture, including research institutions, farm operations, field stations, Extension Service, marketing, processors, equipment, etc. To be given between winter and spring quarters. Considered a spring course for pre-enrollment. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Rappaport in charge)
 (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Rappaport in charge)
 (P/NP grading only.)

Graduate Courses

212. Postharvest Physiology of Vegetables (4) III. Morris, Pratt
 Lecture—2 hours; laboratory—6 hours. Prerequisite: consent of instructor. Comparative physiology of harvested vegetables representing diverse plant structures: emphasis on experimental studies of maturation, compositional and morphological changes, senescence, and physiological disorders; lecture stresses species responses and requirements; laboratory stresses concepts and research procedures. Offered in even-numbered years.

220. Vegetable Genetics and Improvement (4) I. Rick
 Lecture—3 hours; laboratory—3 hours. Prerequisite: Genetics 100B; course 105 and Plant Science 113 recommended. Breeding systems of vegetable species as affected by self-incompatibility, flower structure, pollen vectors, and other reproductive factors. Problems of chromosome number and structure, heterosis, pest resistance, and species hybrids peculiar to vegetable improvement.

290. Seminar (1) I, II, III. The Staff (Spurr in charge)
 Discussion—1 hour. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Rappaport in charge)
 Prerequisite: consent of instructor. Current concepts, techniques, and procedures applicable to research and to the production of vegetables.

299. Research (1-12) I, II, III. The Staff (Rappaport in charge)
 (S/U grading only.)

Veterinary Medicine, School of

William R. Pritchard, D.V.M., Ph.D., J.D., Dean of the School

Edward A. Rhode, D.V.M., Associate Dean—Instruction

Richard H. McCapes, D.V.M., Associate Dean—Public Programs

Bennie I. Osburn, D.V.M., Ph.D., Associate Dean—Research

Gaylord M. Conzelman, Jr., Ph.D., Associate Dean—Student Services

William J. Winchester, D.V.M., Assistant Dean
 School Office, 1024 Haring Hall (752-1360)

Courses in Veterinary Medicine

Upper Division Courses

107. Principles of Anesthesiology and Surgery (5) I, Leighton, Lohse
 Lecture—3 hours; laboratory—6 hours. Prerequisite: second-year standing in School of Veterinary Medicine. Course in the principles of surgery and anesthesiology including instruction in surgical anatomy and techniques of surgery and anesthesia.

135. Hemolymphatic System: Normal Structure and Function (3) III. Jain
 Lecture—14 sessions; laboratory—13 3-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor. Consideration of the development, structure and functions of erythrocytes, leukocytes, platelets, and hematopoietic and lymphoid tis-

sues; hematopoiesis and its regulation; hemoglobin synthesis; blood groups; hemostasis and blood coagulation; methods of study including laboratory exercises.

Graduate Courses

203. Epidemiology, Statistics and Experimental Design (3) I. Ruppamer
 Lecture—20 hours total; laboratory—10 hours total. Prerequisite: fourth-year standing in the School of Veterinary Medicine or consent of instructor. Concentration on basic techniques for (1) epidemiological surveillance and (2) intensive epidemiological follow-up, as applied to (1) fattening-type operations (feedlots, broiler farms, etc.) and (b) breeder-type operations (dairies, cow-calf ranches, egg producers, etc.).

205. Equine Surgery (2) III. Wheat
 Lecture—2 hours. Prerequisite: fourth-year standing in the School of Veterinary Medicine or consent of instructor. Course designed to allow senior veterinary students additional training and experience with surgical procedures in the horse.

205L. Equine Surgery Laboratory (1) III. Wheat
 Laboratory—3 hours. Prerequisite: fourth-year student in School of Veterinary Medicine and course 205 (concurrently). Specific surgical procedures of the horse demonstrated and performed by students. Participants in course work in groups of three on rotating basis. Limited enrollment.

206. Equine Anesthesia and Intensive Care (1) I, Steffey
 Lecture—1 hour. Prerequisite: fourth-year standing in the School of Veterinary Medicine or consent of instructor. Course dealing with basic and applied anesthesia and intensive care in the equine.

207. Small Animal Anesthesiology (1) II. Haskins
 Lecture—1 hour; video tapes and home study. Prerequisite: third-year standing; candidate for DVM degree. Small animal anesthesiology emphasizing the influence of pathophysiology on anesthetic homeostasis and techniques suitable for animals of poor physical status using opiates, relaxants and dissociative agents.

211A. Laboratory Animal Medicine (2) II. Sedgwick
 Lecture—2 hours (includes demonstrations). Prerequisite: third-year standing in School of Veterinary Medicine or graduate student 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 needs of clinical and research veterinarians.

211B. Laboratory Animal Medicine (2) III. Sedgwick
 Lecture—2 hours. Prerequisite: enrollment in Zoological Medicine Track, graduate student or consent of instructor. Prevention, diagnosis and therapy of medical problems in rabbits, guinea pigs, hamsters, mice, rats and other laboratory species.

213. Medical Primatology (2) III. Henrickson
 Lecture—2 hours. Prerequisite: enrollment in Zoological Medicine Track, graduate student or consent of instructor. Major diseases, medical management and husbandry of captive nonhuman primates. (S/U grading only.)

215. Management and Diseases of Captive Wildlife (2) II. Fowler
 Lecture—2 hours. Prerequisite: enrollment in Zoological Medicine Track of Veterinary School, graduate student or consent of instructor. Lectures, demonstrations and discussions used to illustrate selected medical problems of captive wild animals.

216. Aquatic Animal Medicine (2) II. Fowler
 Lecture—2 hours. Prerequisite: fourth-year standing in the School of Veterinary Medicine. Etiology, pathology, diagnosis, treatment and prevention of diseases of fish and of some selected aquatic arthropods and mammals. Preventive management of diseases in aquaculture.

217. Cage Bird Medicine (1) II. Fowler
 Lecture—1 hour. Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor. Medical and surgical problems of caged birds; handling and restraint, feeding, nutritional and infectious diseases, anesthesia and surgery, plus problems of organ systems.

218. Diseases of Free Living Wildlife (2) III. Fowler
 Discussion—2 hours. Prerequisite: enrollment in Zoological Medicine Track of Veterinary School, graduate student or consent of instructor. Directed discussions following the reading of selected papers on free-living wildlife medicine topics. Discussions will emphasize ecological implications, geographical distribution and epidemiology.

221. Neurology: Abnormal (4) III. Holliday
 Lecture—36 hours; laboratory—six 2½-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine. Abnormal function of the nervous system and diseases affecting the nervous system in animals. The man-

ifestation of diseases, pathology, pathogenesis, diagnosis and medical and surgical treatments of neurologic disease will be discussed.

223. Small Animal Ophthalmology (2) III. Buyukmihci
Lecture—2 hours. Prerequisite: course 422. The diagnosis and treatment of commonly encountered eye diseases of small animals.

226. Advanced Small Animal Cardiology (1½) III. Thomas
Lecture—15 hours total for course. Prerequisite: course 425B or the equivalent. Cardiovascular diseases of canine and feline species.

228. Food Animal Medicine (2) II. Hjerpe in charge
Lecture—2 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine, or consent of instructor. Selected diseases of cattle, sheep, goats, and swine are discussed, with emphasis on pathogenesis, treatment and control. Major areas include respiratory diseases of sheep and cattle, urology, and diseases of the bovine mammary system.

***228L. Food Animal Medicine (1) II.** Baker and staff
Discussion-laboratory—3 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Selected topics of food animal disease with emphasis on control of mastitis and internal and external parasitism.

229. Herd Health Management (3) III. Hjerpe in charge
Lecture—3 hours. Practical sessions for delivering veterinary service to feedlot, dairy, cow-calf, stocker, sheep and swine production units are considered, with emphasis on prevention and control of disease.

235. Hemolymphatic: Abnormal (6) I. Carlson
Lecture—39 hours total; laboratory 42 hours total. Prerequisite: third-year standing in School of Veterinary Medicine. Abnormal function of the hemolymphatic system and diseases affecting the blood, blood forming organs and lymphatic system in animals. The manifestation of these diseases, pathology, pathogenesis, diagnosis and medical and surgical treatments of hemolymphatic disease will be discussed.

245. Small Animal Theriogenology (1) II. Feldman
Lecture—1 hour. Prerequisite: third-year standing in School of Veterinary Medicine. Conditions affecting the reproductive system in the dog and cat, with emphasis on symptomatology, pathophysiology and treatment. The development of diagnostic and therapeutic approaches to the clinical patient will be stressed.

246. Food Animal Theriogenology (3) II. Kendrick
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 445A. Conditions affecting the reproductive system in the cow, sow, ewe and goat, with emphasis on symptomatology, pathophysiology, treatment, control and prevention.

247. Equine Theriogenology (3) II. Hughes
Lecture—2 hours; laboratory—3 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor. Special problems of equine reproduction with emphasis on methods of diagnosis and the interpretation of clinical and laboratory findings.

249. Summer Clinics (5 or 16) Extra-session summer. Hjerpe
Active participation in clinic—40 hours (either four or six weeks). Prerequisite: completion of first-year of study in School of Veterinary Medicine. Diagnosis and treatment of animal diseases. Students responsible for case records, care of patients, physical examinations, and participation in surgery. Grades determined by the teaching faculty by observation of student's performance of assigned duties, by rounds and discussions, the preparation of case records, and competence and responsibility shown in the care of patients. In some sessions, students serve in the emergency, on-call capacity. Student has option of completing one to two sessions. (S/U grading only.)

255. Integumentary System (5) I. Stannard
Lecture—45 hours total; laboratory—10 hours total. Prerequisite: third-year standing in School of Veterinary Medicine. Course covers structure, function, pathologic and clinical aspects including therapeutics of the integumentary system and diseases of the integumentary system of animals.

260. Emergency and Critical Patient Care (2) II. Parker in charge
Lecture—14 meetings total; laboratory—3 meetings total. Prerequisite: fourth-year standing in School of Veterinary Medicine. To introduce the fourth-year veterinary student to the essential and practical concepts of care for emergency and critically ill patients.

261. Small Animal Orthopedics (2) III. Wind
Lecture—15 meetings total; laboratory—3 meetings total. Prerequisite: fourth-year standing in School of Veterinary Medicine. Surgical approaches to joints of the shoulder, hip, elbow and stifle, and fractures of the humerus, radius ulna, pelvis, femur and tibia.

262. Radiographic Diagnosis—Small Animal (3) I. Suter and staff
Lecture—3 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Diagnostic radiography of small animals for the student electing small animal and mixed tracks. Non-contrast radiology and special procedures will be discussed as they relate to the thorax, abdomen, and musculoskeletal system.

268. Equine Lameness and Radiology (4) III. Meagher, O'Brien, Lohse, Pool
Lecture—4 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 the latest technique for treating equine lameness will be discussed. Anatomy and pathology of some areas of the musculoskeletal system will also be presented.

268L. Equine Lameness and Radiology (1) III. Lohse, Pool, O'Brien
Discussion—2 hours, or laboratory—3 hours. Prerequisite: third-year standing in School of Veterinary Medicine, and course 268 (concurrently).

Professional Courses

400A. Veterinary Medicine Orientation (0) I. McGowan
Discussion—eight 2-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor. An overview of the veterinary medical profession emphasizing its many integrants and publics.

400B. Veterinary Medicine Orientation (1) III. McGowan
Laboratory—eight 3-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor. Recognition of animal breeds, breed characteristics and purpose in animal species of veterinary importance. Introduction and practice of procedures of animal handling and restraint and selected techniques of diagnostic examination and therapy. (S/U grading only.)

401. The Normal Animal, Examination and Topographic Anatomy (3) I. Kitchell
Lecture—10 hours; discussion—ten 2-hour sessions; laboratory—ten 3-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine. Anatomic structures, features and landmarks fundamental to an integrated study of organ systems, the performance of physical examination, routine diagnostic and therapeutic procedures.

402A. Cell Biology (3.5) I. Plopper
Lecture—22 hours; discussion—five 2-hour sessions; laboratory— eight 3-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine. A functional and structural study of cells and their organelles with emphasis on the organization and specialization of cells to form the primary tissues of the body.

403A. Principles of Pharmacology (1.7) III. Joy
Lectures—17 sessions. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor. Designed to provide veterinary medical students with a basic foundation for understanding how drugs are used to restore diseased animals to normal health. Course introduces principles of pharmacology and begins a consideration of drugs by pharmacological class.

403B. Principles of Pharmacology (3.5) I. Giri
Lecture—3 hours; laboratory—demonstration—five 3-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine. Course examines the mechanisms and effects of drugs on various organ systems from a comparative, animal oriented view-point. The laboratories are designed to demonstrate the application of such material to therapeutics.

404. Fundamentals of Radiography (2.7) III. Hornof, Turrel
Lectures—24 one-hour sessions; laboratory—3 three-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine. Ionizing radiation and its interaction with matter and biological systems; instrumentation and principles of diagnostic radiology, radiotherapy and nuclear medicine; diagnostic applications of x-rays and basic principles of veterinary radiology.

405A. Parasitology (3.8) II. Lavoipierre
Lecture—28 hours; 30 one-hour demonstration laboratories. Prerequisite: first-year standing in School of Veterinary Medicine. Course is intended to serve as an introduction to veterinary parasitology. Emphasis is placed on the recognition, life-cycle and ecology of antipod helminth and protozoan parasites of domestic animals. The relationship of these parasites to disease is briefly discussed.

405B. Clinical Parasitology (3) III. Baker
Lecture—2 hours; laboratory—ten 3-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Ecology, pathology, diagnosis, and therapeutics of the more important parasites of domestic animals.

406. Principles of Behavior (1.1) I. Hart
Lecture—1 hour; laboratory—1 session. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor. Normal behavioral patterns dealing with feeding, eliminative, social, sexual and maternal behavior of domestic livestock and pets. Determinants of behavior including genetics, early experience, learning and hormones.

408. Nutrition and Nutritional Diseases in Animals (3.8) II. Morris
Lecture—36 hours total; one 3-hour fieldtrip; laboratory— one 3-hour session. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor. Principles of nutrition and their application to the feeding of small and large animals. Selected clinical material will be discussed in relation to deficiency symptoms, pathology and biochemical lesions.

409A. Epidemiology (2) II. Ruppanner
Lecture—20 1-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine. Introduction to epidemiology and its applications in veterinary medicine.

410. Veterinary Toxicology (2.8) III. Fowler
Lecture—28 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine. Diseases of animals produced by chemical poisons, organic and inorganic. The prevalence of toxic agents in the environment and exposure of animals to them; the incidence, pathology, pathogenesis, diagnosis and treatment of diseases produced by poisons will be discussed.

414. Integrative Physiological Chemistry (6.6) I. Hansen
Lecture—47 hours total; discussion—10 hours total; laboratory—three 3-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine. Physical-chemical principles underlying biological processes; intermediary metabolism and its control. Course will emphasize structural-functional relationship from the molecular to the tissue level to give a background for understanding.

419A. Behavior Therapy in Small Animal Practice (8) III. Hart
Lecture—5 hours total; laboratory—3 hours total. Prerequisite: third-year standing in School of Veterinary Medicine. Clinical application of drug therapy and conditioning procedures to specific type of problem behavior in pet dogs and cats. Overview of pet-owner behavioral interactions. Behavioral consideration in advising clients in selection and raising of dogs and cats.

419B. Application of Behavioral Principles and Large Animal Practice (8) III. Hart
Lecture—8 hours total. Prerequisite: third-year standing in School of Veterinary Medicine. Evaluation of the natural behavioral tendencies of large animals as they relate to modern husbandry and herd health practices. Behavioral stress and disease processes. Treating problems with reproductive behavior. Animal-owner interactions. Species considered are cattle, sheep, swine and horses.

420A. Musculoskeletal Basis of Locomotion (4.9) I, II. Hyde
Lecture—18 hours total; laboratory—31 hours total. Prerequisite: first-year standing in School of Veterinary Medicine. Gross, subgross, light microscopic, electron microscopic, functional anatomy of the musculoskeletal system of selected domestic animals.

420B. Musculoskeletal System-Abnormal Functions (4.5) III. Wind
Lecture—38 hours total; laboratory—7 hours total. Prerequisite: second-year standing in School of Veterinary Medicine. Abnormal function of the musculoskeletal system and diseases affecting the musculoskeletal system in animals. The manifestations, pathology, pathogenesis, diagnosis and medical and surgical treatments of musculoskeletal disease will be discussed.

421A. Neurosciences (4.2) II. Kitchell
Lecture—33 hours total; laboratory—nine 3-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine. An integrated study of the nervous system including gross and microscopic anatomy, neurophysiology and neurological examination of animals.

422. Veterinary Ophthalmology (2.8) I. Cello
Lecture—21 hours total; laboratory—7 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine. Normal structure and function of the eye and the response of the eye to disease. All species of domestic animals will be included. Discussing of selected ocular diseases of various species.

425A. Cardiopulmonary and Renal Systems—Normal Form and Function (8) III. Heusner
Lecture—56 hours total; laboratory—24 three-hour sessions. (discussion-laboratory sessions flexible). Prerequisite: first-year standing in School of Veterinary Medicine. Correlated presentation emphasizing anatomical, physiological aspects of the cardiovascular, respiratory and re-

nal systems of common domesticated animals. Homeostatic mechanisms governing body fluids and electrolytes will be included.

425B. Cardiopulmonary, Renal, Abnormal (8) I-II. Ling
Lecture—64 hours total; laboratory—16 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine. Abnormal function of the circulatory, pulmonary and renal systems and disease affecting these systems in animals. The manifestations, pathology, pathogenesis, diagnosis and medical and surgical treatments of cardiopulmonary-renal disease will be discussed. (Deferred grading only, pending completion of two-quarter sequence.)

427. Equine Internal Medicine (3) III. Carlson
Lecture—30 hours total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Advanced equine medical diseases including sections on general medicine, respiratory and gastrointestinal diseases, cardiology, dermatology, neurology, oncology, and ophthalmology.

430A. Structure and Function of the Gastrointestinal System (3.5) III. Curry
Lecture—24 sessions total; laboratory—11 sessions total. Prerequisite: first-year standing in School of Veterinary Medicine. Structure and function of the normal gastrointestinal system, including ruminants, as a basis for understanding the disease process. Emphasis will be placed on integrating morphology and physiology with respect to gastrointestinal secretions, motility, absorption, and allied processes.

430B. Gastrointestinal Diseases: Gastroenterology (Abnormal) (5) II. Strombeck
Lecture—5 hours. Prerequisite: second-year standing in School of Veterinary Medicine. Abnormal function of the digestive system and diseases affecting the digestive system in all species of animals. The manifestations, pathology, pathogenesis, diagnosis including special diagnostic procedures, and medical and surgical treatments of gastrointestinal disease including diseases of the liver and pancreas.

431. Metabolism (1.5) II. Black, Freedland
Lecture—15 hours total. Prerequisite: first-year standing in School of Veterinary Medicine. Interaction of carbohydrate, lipid and protein metabolism with emphasis on physiological control mechanisms in animals; factors affecting metabolic control including hormones, nutrition and development; adaptations involved in homeostasis. Significance of these processes in health and in disease.

434. Infectious Diseases (5.4) I-II. Pedersen
Lecture—54 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine. An overview of select infectious diseases of companion and food animals including poultry. (Deferred grading only, pending completion of two-quarter sequence.)

436. Public Health and Food Safety (2) III. Genigeorgis
Lecture—2 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Introduction to preventive aspects of veterinary medicine as they relate to zoonoses, environmental hygiene and the safety of foods of animal origin.

440. Endocrine System Normal and Abnormal Structure and Function (2.8) II. Kennedy
Lecture—24 hours total; discussion—three 3-hour sessions; laboratory—one 3-hour session. Prerequisite: second-year standing in School of Veterinary Medicine. A correlated presentation of the structure and function of the normal and diseased endocrine glands of domesticated animals.

445A. Reproduction (6.6) II, III. Kendrick and staff
Lecture—44 hours total; laboratory—22 hours total. Prerequisite: second-year standing in School of Veterinary Medicine. Course covers structure, function, pathologic and clinical aspects of reproduction (normal and abnormal).

450. Immunology (3.3) I, Osebold
Lecture—21 hours total; laboratory—12 two-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine. Concepts of immunobiology. Dynamics of infection and resistance. Pathogenetic mechanisms in immunological diseases, allergy, cancer immunology.

451. Veterinary Bacteriology and Mycology (5.7) I. Biberstein, Buchanan, Hirsh
Lecture—37 hours total; laboratory—20 two-and-one-half-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine. An introduction to the nature of bacteria and fungi, their relation to animal disease, and the methods of diagnosing bacterial and mycotic disease. (Deferred grading only, pending completion of two-quarter sequence.)

452. General Pathology (4.2) I. Moore, Moulton, Schwartz
Lecture—24 sessions total; laboratory—36 sessions total. Prerequisite: second-year standing in School of Veterinary Medicine. Basic pathologic processes, especially their nature and pathogenesis. Includes degenerative changes, circulatory disturbances, inflammation and repair, abnormalities of cell growth and differentiation, and basic immunopathology.

453. Viral Pathogens of Animals (2.6) II. Zee
Lecture—16 hours total; laboratory—10 hours total. Prerequisite: second-year standing in School of Veterinary Medicine. The biology of infectious diseases caused by viruses. Virus-host relationship with emphasis on pathogenesis, immunity and diagnosis.

456. Jurisprudence and Law for the Veterinarian (2) II. Wilson
Lecture—20 hours total. Prerequisite: third-year standing in School of Veterinary Medicine. Introduction to principles of veterinary medical jurisprudence and legal concepts pertinent to professional activities.

459. Veterinary Clinical Cytology (1.5) III. Zinkl
Lecture—8 hours total; laboratory—7 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Cytology of effusions, aspirates, washings and impression smears of organs and tissues having neoplastic, inflammatory and degenerative lesions.

470A-470B-470C. Hospital Practices (2-2-2) I-II-III. The Staff (Director VMTH in charge)
Clinics—8 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Assignments in the medical and surgical services and clinical diagnostic laboratories of the Veterinary Medical Teaching Hospital. (S/U grading only, pending completion of three-quarter sequence.)

471. Urban Practice Clinics (7.5-15) I-II-III. The Staff (Director VMTH in charge)
Veterinary clinical practices—30-45 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Clinical training for veterinary students enrolled in track programs. May be repeated for credit. (Deferred grading only, pending completion of three-quarter sequence.)

472. Large Animal Practice Clinics (7.5-15 per quarter) I-II-III. The Staff (Director VMTH in charge)
Veterinary clinical practices—30-45 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Clinical training for students enrolled in track programs. May be repeated for credit. (Deferred grading only, pending completion of three-quarter sequence.)

473. Equine Practice Clinics (7.5-15 per quarter) I-II-III. The Staff (Director VMTH in charge)
Veterinary clinical practices—30-45 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Clinical training for students enrolled in track programs. May be repeated for credit. (Deferred grading only, pending completion of three-quarter sequence.)

474. Food Animal Practice Clinics (7.5-15 per quarter) I-II-III. The Staff (Director VMTH in charge)
Veterinary clinical practices—30-45 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Clinical training for students enrolled in track programs. May be repeated for credit. (Deferred grading only, pending completion of three-quarter sequence.)

475. Zoological Practice Clinics (7.5-15 per quarter) I-II-III. The Staff (Director VMTH in charge)
Veterinary clinical practices—30-45 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Clinical training for students enrolled in track programs. May be repeated for credit. (Deferred grading only, pending completion of three-quarter sequence.)

480A-480B-480C. First-year Clinic Rounds (1.2) I-II-III. The Staff (Director VMTH in charge)
Discussion—twelve 1½ hour sessions total. Prerequisite: first-year standing in School of Veterinary Medicine. Discussion of selected cases from the clinic. (S/U grading only, pending completion of three-quarter sequence.)

481A-481B-481C. Second-year Clinic Rounds (1.2) I-II-III. The Staff (Director VMTH in charge)
Discussion—twelve 1½ hour sessions total. Prerequisite: second-year standing in School of Veterinary Medicine. Discussion of selected cases from the clinic. (S/U grading only, pending completion of three-quarter sequence.)

Veterinary Microbiology

(School of Veterinary Medicine)

Norman F. Baker, D.V.M., Ph.D., Chairperson of the Department

Department Office, 2075 Haring Hall (752-1400)

Faculty

Alexander A. Ardans, D.V.M., Associate Professor

Norman F. Baker, D.V.M., Ph.D., Professor

Ernst L. Biberstein, D.V.M., Ph.D., Professor

Audria M. Buchanan, Ph.D., Associate Professor

Laurel J. Gershwin, D.V.M., Ph.D., Assistant Professor

Dwight C. Hirsh, D.V.M., Ph.D., Associate Professor

Michel M. J. Lavoipierre, M.B., Ch.B., Professor

Edmond C. Loomis, Ph.D., Lecturer

Delbert G. Mc Kercher, D.V.M., Ph.D., Professor

John W. Osebold, D.V.M., Ph.D., Professor

Moshe Shifrine, Ph.D., Adjunct Professor

Ming Ming Wong, Ph.D., Associate Professor

Yuan Chung Zee, D.V.M., Ph.D., Professor

Courses in Veterinary Microbiology

Upper Division Courses

126. Fundamentals of Immunology (3) I, Buchanan, Hirsh
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. Gershwin
Laboratory—6 hours. Prerequisite: course 126; introductory course in microbiology. Laboratory procedures in immunology. The immune response to antigens, antigen-antibody interactions, hypersensitivity mechanisms. Limited enrollment. (PNP grading only.)

127. Medical Bacteriology and Mycology (3) III. Biberstein, Hirsh
Lecture—2 hours; discussion—1 hour; paper or seminar presentation. Prerequisite: fundamentals of immunology and microbiology. The bacterial and mycotic pathogens of man and animals, with emphasis on pathogenic mechanisms and ecologic aspects of infectious disease.

127L. Medical Microbiology Laboratory (3) III. Biberstein
Laboratory—6 hours; follow-up work—2-3 hours. Prerequisite: general bacteriology with laboratory; course 127 (may be taken concurrently) or the equivalent. Laboratory aspects of pathogenic bacteria and fungi, principles of laboratory diagnosis of bacterial and mycotic infections.

128. Biology of Animal Viruses (3) I, Zee, Manning (Bacteriology)
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.

***130. Animal Virology Laboratory** (4) II. Zee
Discussion—2 hours; laboratory—6 hours. Prerequisite: course 128 or consent of instructor. Introduction to laboratory procedures employed in the study of animal viruses. Emphasis placed on propagation, assay, isolation, and identification of animal viruses including viral pathogenesis and serology.

132. Introduction to Parasitology (5) III. Wong
Lecture—3 hours; laboratory—6 hours. Prerequisite: Zoology 2-2L. 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 (Baker in charge)
Lecture—3 hours; laboratory—9 hours. Prerequisite: consent of instructor. (P/NP grading only.)
- 199. Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Baker in charge)
(P/NP grading only.)

Graduate Courses

- 270. Advanced Immunology** (6) III. Osebold
Lecture—3 hours; laboratory—9 hours. Prerequisite: course 126 or Veterinary Medicine 105 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 odd-numbered years.
- 291. Seminar in Immunology** (1) I, II, III. Shifrine
Seminar—1 hour. A discussion of the current topics in immunology.
- 292. Seminar in Animal Virology** (1) I, II, III. Zee
Seminar—1 hour. A discussion of the current topics in animal virology. (Same course as Bacteriology 296.)
- 293. Seminar in Infectious Diseases** (1) I, II, III. Biberstein, Hirsch
Seminar—2 hours (alternate weeks). A discussion of the current topics in infectious diseases in man and animals. (S/U grading only.)
- 294. Seminar in Parasitology** (1) I, II, III. Baker, Wong
Seminar—1 hour. A discussion of the current topics in parasitology entomology.
- 296. Microbiological Diagnosis** (2-5) I, II, III. Biberstein, Hirsch
Laboratory—6-15 hours. Prerequisite: consent of instructor; concurrent enrollment in course 293 recommended. Identification of microbial pathogens in clinical and pathological specimens. Casework in Veterinary Medical Teaching Hospital diagnostic laboratory. (S/U grading only.)
- 298. Group Study** (1-5) I, II, III. The Staff (Baker in charge.)
- 299. Research** (1-12) I, II, III. The Staff (S/U grading only.)

Viticulture and Enology

(College of Agricultural and Environmental Sciences)

A. Dinsmoor Webb, Ph.D., Chairperson of the Department
Department Office, 1023 Wickson Hall
(752-0380)

Faculty

Curtis J. Alley, Ph.D., Lecturer
Maynard A. Amerine, Ph.D., Professor Emeritus
Harold W. Berg, M.S., Professor Emeritus
Roger B. Boulton, Ph.D., Assistant Professor
James A. Cook, Ph.D., Professor
Richard E. Kepner, Ph.D., Professor (Chemistry)
W. Mark Kliewer, Ph.D., Professor
Ralph E. Kunkee, Ph.D., Professor
Lloyd A. Lider, Ph.D., Professor
Carole D. Meredith, Ph.D., Assistant Professor
Klayton E. Nelson, Ph.D., Professor
Ann C. Noble, Ph.D., Associate Professor
Harold P. Olmo, Ph.D., Professor Emeritus
Cornelius S. Ough, D.Sc., Professor
Vito S. Polito, Ph.D., Assistant Professor (Pomology)
Vernon L. Singleton, Ph.D., Professor
Robert J. Weaver, Ph.D., Professor
A. Dinsmoor Webb, Ph.D., Professor
Lynn A. Williams, Ph.D., Assistant Professor

Albert J. Winkler, Ph.D., L.L.D., Professor Emeritus

Related Major Programs. See majors in Fermentation Science (page 210) and Plant Science (page 276).

Related Courses. See courses in Food Science and Technology; Plant Science 112, 112L.

Courses in Viticulture and Enology

Lower Division Courses

- 3. Introduction to Wine Making** (3) I, II, III. Kunkee, Webb, Singleton
Lecture—2 hours; discussion—1 hour. An introduction to wine technology, including effects of alcohol, history of wine, fermentation, production practices, wine types, and the wine industry of California and other wine producing areas.
- 99. Special Study for Undergraduates** (1-5) I, II, III. The Staff (Webb in charge)
(P/NP grading only.)

Upper Division Courses

- 100. Grape Growing** (3) III. Weaver
Lecture—2 hours; discussion or vineyard trips—1 hour. Prerequisite: six units of plant science, botany and/or biology; or consent of instructor. Grape growing including botany and morphology, native distribution and domestication, propagation, varieties and uses, climatic requirements, utilization of the crop, grape regions of the world, production practices, and some common diseases and insect pests.
- 105. Systematic Viticulture Including Fruit Maturation and Handling** (3) I. Nelson, Lider
Lecture—1 hour; laboratory—6 hours. Prerequisite: Plant Science 2 or consent of instructor. Principal fruiting varieties, rootstocks, and species of grapes; environmental factors affecting composition of the fruit during growth and maturation; fruit handling practices for wine, raisin, and table grape production.
- 116A. General Viticulture** (3) II. Cook
Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 2 and consent of instructor. Principles underlying pruning, training, grafting, and propagation of vines; environmental and economic factors affecting choice of vineyard type and location; establishment of vineyards.
- 116B. General Viticulture** (3) III. Kliewer
Lecture—2 hours; eight 3-hour laboratory sessions; one Saturday field trip. Prerequisite: course 116A. Economics and scientific principles of recommended vineyard management practices including irrigation, mineral and carbohydrate nutrition, flower development and fruit set, virus and fungal diseases, and insect control.
- 123. Analysis of Musts and Wines** (3) I, Ough
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: Chemistry 5; Food Science and Technology 103 recommended. The principles and practice of wine analysis.
- 124. Wine Production** (3) I, Webb
Lecture—2 hours; laboratory—3 hours. Prerequisite: Bacteriology 2; Chemistry 5, 8B. Recommended: courses 3 and 123 (may be taken concurrently). The 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) III. Noble
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: Chemistry 8B. Recommended: Food Science and Technology 107, 107L; and courses 3, 123, and 124. Major types of wines and the factors influencing their quality; principles of sensory evaluation.
- 126. Wine Processing** (3) II. Boulton
Lecture—2 hours; laboratory—3 hours. Prerequisite: Bacteriology 2; Chemistry 5, 8B. Recommended: Chemistry 10, 107B; Plant Science 2 and courses 3, 123, 124 and 125. Principles and theory of nonbacterial disorders: metal, tartrate, protein, color, oxidation and their control by clarification, refrigeration, filtration and ion exchange.
- 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** (4) II. Williams
Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 8B or the equivalent; Food Science and Technology 110A recommended. Distillation principles and practices; production technology of brandy, whiskey, and other distilled beverages, characteristics of raw materials, fermentation factors, distillation and aging, chemical analysis and sensory evaluation.

- 192. Internship** (1-12) I, II, III, summer. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units. Work-learn experience related to Fermentation Sciences (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 (Webb in charge)
Prerequisite: consent of instructor. (P/NP grading only.)
- 199. Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Webb in charge)
(P/NP grading only.)

Graduate Courses

- 208. Plant Hormones and Regulators** (3) I, Weaver, Labavitch (Pomology)
Lecture—3 hours. Prerequisite: Botany 111B; Chemistry 8B; or consent of instructor. Open to qualified upper division students. History, occurrence, extraction, measurement, chemical nature, developmental and physiological effects, role, and theories of action of plant hormones and growth regulators; methods of application of growth regulators and factors altering effectiveness; application in the control of plant and fruit responses.
- 217. Microbiology of Wine Production** (3) III. Kunkee
Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 123, 124; Bacteriology 3; Biochemistry 101A; Chemistry 8B. Recommended: courses 125, 126. Nature, development, physiology, biochemistry, and control of yeasts and bacteria involved in the making, aging, and spoilage of wines.
- 219. Plant Phenolics** (3) II. Singleton
Lecture—3 hours. Prerequisite: Biochemistry 101B 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** (2) II. Boulton
Lecture—3 hours; 4 design classes; field trip. Prerequisite: course 135, Food Science and Technology 110A-110B, and Engineering 5 or Mathematics 19. A graduate course which specializes in the design and economic evaluation of modern commercial wineries. Emphasis is given to the design of new wineries and the interaction of size, grape and bottle prices on the economic feasibility of the venture. (Offered in odd-numbered years.)

- 290. Seminar** (1) II, III. Webb
Seminar—1 hour. Prerequisite: consent of instructor.
- 291. Advances in Viticulture** (1) II. Weaver
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. Kunkee
Discussion—1½ hours, seven to ten weeks. Prerequisite: courses 3, 123, 124, 125, 126 (3, 125 may be taken concurrently). Discussions of previously assigned reading material, usually in the form of two to three reprints. Discussions led by staff enologists to acquaint students with their current research interests. (S/U grading only.)
- 298. Group Study** (1-5) I, II, III. The Staff (Webb in charge)
(S/U grading only.)
- 299. Research** (1-12) I, II, III. The Staff (Webb in charge)
(S/U grading only.)

Water Science

(College of Agricultural and Environmental Sciences)

See under the Department of Land, Air and Water Resources.

Related Major Program. See the major in Soil and Water Science, page 295.

Graduate Study. A program of study is offered leading to the M.S. degree in Water Science. Detailed information can be obtained from the graduate adviser. Also see page 99.

Graduate Adviser. D.E. Rolston.

Related Courses. See Engineering: Civil 141L, 142, 143, 144, 146, 148A, 148B; Plant Science 130. See also listings for Atmospheric Science, Resource Sciences, and Soil Science.

Courses in Water Science

Questions pertaining to the following courses should be directed to the instructor or to the Resource Sciences Teaching Center, 122 Hoagland Hall (752-1669).

Lower Division Courses

10. Water and Man (3) III. Hagan

Lecture—3 hours. Water as a factor in civilization and man's environment. Water supply and utilization problems of agricultural, domestic, industrial, and other water users in developed and developing nations. A cultural and technical course providing an introduction to water science and engineering.

41. Ecology of Polluted Waters (3) II. Knight

Lecture—3 hours. Prerequisite: Biological Sciences 1 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 heat on aquatic life.

92. Water Science Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)

Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn experience off and on campus in water science. Internship supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Principles of Water Science (4) II. The Staff (Silk in charge)

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 1A, Physics 2A, and Botany 2 or Plant Science 2; Chemistry 1B and Physics 2B 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.

103. Water Quality, Salt Control and Reclamation (4) I, Biggar

Lecture—3 hours; laboratory—3 hours. Prerequisite: course in soil or water chemistry 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.

104. Plant-Water-Soil Relationships (4) III. Hsiao

Lecture—3 hours; discussion—1 hour; two mid-quarter examinations to be arranged. Prerequisite: course 100 or the equivalent preparation in elements of water in soil and plants. Soil Science 2 and one additional course in soils 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.

110A. Irrigation Principles and Practices (3) II. Henderson

Lecture—3 hours. 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.

110B. Irrigation Principles and Practices (3) I, Fereras

Lecture—3 hours. Prerequisite: Physics 2B. General course for agricultural and engineering students dealing with engineering aspects of irrigation on the farm. Irrigation distribution systems; water measurement; farm water supply including wells and pumping plants; water application methods; land grading.

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 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.

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.

140. Groundwater Hydrology (3) II, Luthin

Lecture—3 hours. Prerequisite: course 100, Soil Science 2. Groundwater occurrence and development, flow through porous media. Groundwater wells, drainage of agricultural lands. Reclamation procedures. Course not recommended for Engineering majors.

141. Hydrology (3) II, Burgy

Lecture—3 hours. Prerequisite: consent of instructor. Principles of hydrologic analysis including consideration of precipitation, stream flow and ground water phenomena.

150. Water Law and Water Institutions (3) I, Malakoff

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.

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.

160. Water Application Systems (4) I, Pruitt

Lecture—3 hours; laboratory—3 hours. Prerequisite: senior standing in Soil and Water Science or Civil Engineering, or consent of instructor. Design, construction and operation of water-application systems (with emphasis on farm irrigation methods) and appurtenant structures. Preparation of land for irrigation. Problem solving and field and laboratory exercises.

170. Field Studies in Irrigation and Drainage Management (1) Extra-session summer. Robinson

Discussions and field observations—8 days. Prerequisite: senior standing in Soil and Water Science or Engineering or consent of instructor. Field observations and discussions on irrigation and drainage systems in the San Joaquin Valley; San Diego Area; Imperial Valley; Yuma, Arizona; and Coachella Valley. (P/NP grading only.)

172. Farm Irrigation Management (3) III. Henderson

Lecture—3 hours; one field trip. Prerequisite: course 104 or 110A, or consent of instructor. The water budget is used as a means of orderly analysis of plant, soil, climatic, systems, and operational factors to develop a rationale for farm irrigation practices. Plant and soil factors are emphasized.

180. Chemistry of the Hydrosphere (3) III. Tanji

Lecture—3 hours. Prerequisite: Chemistry 5 and introductory courses in geology, soils, hydrology or limnology. To provide an understanding of various mechanisms and processes regulating the chemistry of natural waters. Linkage between hydrologic and geochemical cycles is stressed. Covered are chemical characteristics of rainwater and snow, streams and rivers, lakes, ground waters, estuaries, and oceans.

192. Water Science Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)

Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn 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. Water-Soil-Plant Relationships in Irrigation Programming (3) III. Hagan

Lecture—3 hours. Prerequisite: course 104 or consent of instructor. Selected topics including prediction of crop re-

sponses to irrigation, evapotranspiration and water requirements, production functions, strategy for using limited water supplies, and irrigation planning and operations for optimizing water use and crop production under conditions of developed and developing nations.

201. Advanced Plant-Water Relations (3) I, Hsiao

Lecture—3 hours; discussion sessions. Prerequisite: course 104 or Plant Science 101 or Botany 111A; elementary knowledge of metabolism and rudiments of thermodynamics or concurrent enrollment in 1 unit of course 29B with instructor. Chemical and component potentials of water; quantitative aspects of water transport to, within, and from plants; dynamics, regulation, and environmental factors affecting plant water status; metabolic and other characteristics associated with efficient water use, and with xerophytism; responses to water deficiency and salinity. Offered every fourth quarter (Winter 1981).

202. Evapotranspiration (2) II, Pruitt

Lecture—2 hours. Prerequisite: Atmospheric Science 20-20L or 105, or consent of instructor. Radiation and energy balances of water, soil and vegetative surfaces and the effects of wind; temperature, humidity thereon. Lysimeter and other measurement techniques. Prediction of evapotranspiration from aerodynamic, energy balance, and empirical approaches.

205. Water-Resource Systems Analysis: Deterministic Models (3) I, Mariño

Lecture—3 hours. Prerequisite: Mathematics 22A or consent of instructor; course 141 or the equivalent. Applications of deterministic linear and dynamic programming techniques to water-resource systems design. Allocation of aqueduct and reservoir capacities, conjunctive surface and groundwater systems. Sequencing of water supply projects.

207. Water-Resource Systems Analysis: Stochastic Models (3) I, Mariño

Lecture—3 hours. Prerequisite: course 205 and Mathematics 131A, or consent of instructor. Applications of stochastic linear and dynamic programming, Markov chains, and inventory theory to water-resource systems design. Design and operating policy models of reservoirs. Water quality management models. Offered in odd-numbered years.

215. Advanced Topics in Water and Soil Chemistry (3) II, Biggar

Lecture—3 hours. Prerequisite: 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 electro-kinetic properties of clays, membrane phenomena, rate processes and thermodynamic applications to the water soil system. Offered in odd-numbered years.

217. Hydrochemical Models (3) II, Tanji

Lecture—2 hours; laboratory—3 hours. Prerequisite: physical chemistry, calculus and computer programming or consent of instructor. Mathematical and computer modeling of chemical state variables and terrestrial and aquatic systems. Equilibrium and rate models; transport models; systems assessment and simulations.

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 phyecology. 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 even-numbered years.

*250. Physics of Soil Water Movement (3) II, Nielsen

Lecture—3 hours. Prerequisite: Mathematics 22C or consent of instructor, course in physics of soil or water systems recommended. The physics of fluid flow through porous media; miscible and immiscible displacement theories; theory of capillary pressure and pore size distribution with emphasis on unsaturated flow problems; physical aspects or permeability, porosity, specific surface and pore structure. Offered in odd-numbered years.

290. Seminar (1) II, Knight

Seminar—1 hour. Prerequisite: graduate standing. Critical review of relevant water quality problems and recent water quality research and literature.

291. Seminar in Water-Soil-Plant Relations and Irrigation (1) I, II, III. Henderson, Silk, Hsiao

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.)

NOTE: For key to footnote symbols, see page 130.

- 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) (SU grading only.)

Wildlife and Fisheries Biology

(College of Agricultural and Environmental Sciences)

Dennis G. Raveling, Ph.D., Chairperson of the Division

Division Office, 64 Briggs Hall (752-6586)

Faculty

- Daniel W. Anderson, Ph.D., Associate Professor
 Louis W. Botsford, Ph.D., Assistant Professor
 Joseph J. Cech, Jr., Ph.D., Assistant Professor
 Walter E. Howard, Ph.D., Professor
 Nadine K. Jacobsen, Ph.D., Assistant Professor
 Dale F. Lott, Ph.D., Professor
 Rex E. Marsh, A.B., Lecturer
 Peter B. Moyle, Ph.D., Associate Professor
 Dennis G. Raveling, Ph.D., Professor
 Robert G. Schwab, Ph.D., Associate Professor

The Major Program

The Wildlife and Fisheries Biology major deals with the interface between the needs of man and wildlife which must be maintained for the sake of future generations for ecological stability, recreation, and food supply. Certain species of wildlife are threatened because they cannot adapt to man's activities, whereas others have thrived so well under man-made changes in the environment that their numbers must be controlled. Emphasis is placed on biological and physical sciences, with specialization in wildlife or fisheries. This program provides training in biology appropriate to careers as wildlife or fisheries biologists, animal control specialists, game or fish technicians, or, following additional academic preparation, for careers in teaching, research, and administration in those areas.

Wildlife and Fisheries Biology

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
Preparatory Subject Matter	50
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Computer science (Engineering 5, Animal Science 127, or Mathematics 19)	3
Mathematics (Mathematics 16A, 16B)	6
Physics (Physics 2A, 2B, 2C)	9
Zoology (Zoology 2-2L)	6
Depth Subject Matter	25-32
Chemistry (Biochemistry 101A-101B or Physiological Sciences 101A-101B)	6-7
Ecology (Environmental Studies 100, Entomology 104, or Zoology 125)	3-4
Genetics (Genetics 120 or 100A-100B)	4-6
Physiology (Physiology 110)	5
Vertebrate anatomy (Zoology 105 or 106 and 106P)	4-5
Evolution (Zoology 148, 149, Genetics 103, or the equivalent)	3-5

Breadth Subject Matter	20
English 1 and Rhetoric 1 or the equivalent (see College requirement)	8
Social sciences and humanities†	12

Courses in the Major	11
Wildlife and Fisheries Biology 122, 130, 140	11

Additional Courses (select Plan 1 or Plan II)

Plan 1: Wildlife Biology Specialization	28-31
Statistics (Statistics 13 plus one upper division course selected with adviser's approval; or Agricultural Science and Management 150)	4-6
Botany (Botany 102 or 108, 117)	8-9
Wildlife and Fisheries Biology 101, 110, 111, 111L	16

Plan II: Fisheries Biology Specialization	29-31
Aquatic entomology (Entomology 116)	3
Limnology/oceanography (Environmental Studies 116, 151, or 150C)	3-4
Statistics (Statistics 13 or Agricultural Science and Management 150; plus two upper division courses selected with adviser's approval)	9-10
Fisheries biology (Wildlife and Fisheries Biology 102, 120, 121)	14

Unrestricted Electives

Total Units for the Major (minimum) 180

Major Adviser. N.K. Jacobsen.

Graduate Study. See page 99.

Related Courses. A selection of courses may depend on each student's special interests. *A set of related courses is available from advisers.*

Courses in Wildlife and Fisheries Biology

Lower Division Course

10. Wildlife Biology (4) I. The Staff
 Lecture—4 hours. Prerequisite: Biological Sciences 1 recommended. Introduction to the biology and ecology of aquatic and terrestrial wildlife, and basic principles of management.

92. Internship (1-6) I, II, III. The Staff (Department Chairperson in charge)
 Laboratory—3-18 hours. Prerequisite: lower division standing and consent of instructor. Work-learn 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

101. Field Studies in Wildlife Biology (6) Extra-session summer. The Staff
 Lecture—1 hour; laboratory—40 hours; field study—4 weeks, and data analysis and presentation—2 weeks. Prerequisite: upper division course in ecology and laboratory in biology of birds or mammals; consent of instructors. Intensive 4 weeks field study of the biology and management of wildlife followed by 2 weeks of data analysis and presentation. Emphasis is on individual investigation affording the student the opportunity to implement knowledge gained from other courses on biology and management of wildlife.

102. Field Studies in Fisheries Biology (6) Extra-session summer. The Staff
 Lecture—1 hour; laboratory—40-80 hours; field study—4 weeks, and data analysis and presentation—2 weeks. Prerequisite: upper division course each in ecology and fish biology; consent of instructors. Intensive field study of the biology and management of fishes, followed by sample processing, data analysis and presentation. Emphasis is on individual projects that utilize knowledge gained from other courses on fish and fisheries.

110. Mammalian Biology and Ecology (5) II. Schwab
 Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: Biological Sciences 1, Botany 2, and Zoology 2-2L, or the equivalent; course in ecology recommended. Integrated introduction to the biology and ecology of nondomestic mammals. Emphasis on natural history, taxonomy, geographical-ecological distribution, anatomical-physiological-behavioral adaptations of mammals to their environment, and research-management methodologies.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

111. Biology and Management of Wild Birds (3) I, Anderson, Raveling
 Lecture—3 hours. Prerequisite: upper division course in ecology or consent of instructor. Phylogeny, distribution, migration, reproduction, population dynamics, behavior, and physiological ecology of wild birds. Emphasis on adaptations to environments, species interactions, and management considerations.

111L. Laboratory in Biology and Management of Wild Birds (2) I, Anderson, Raveling
 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, and research and management techniques.

120. Biology of Fish (4) I, Moyle
 Lecture—3 hours; laboratory—3 hours. Prerequisite: Zoology 2-2L or consent of instructor. Introduction to ecology, morphology, evolution, and systematics of freshwater and marine fishes. Laboratory emphasizes morphology and identification, lectures emphasize ecology and its relationship to fish management.

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. Dynamics of Exploited Animal Populations (3) III. Botsford
 Lecture—3 hours. Prerequisite: upper division ecology courses; Mathematics 16A, 16B; Statistics 13. A critical evaluation of the ecological bases for exploiting animal populations (vertebrates and invertebrates). Application of formal logic to quantitative concepts of population analyses and strategies of hypothesis testing. Simulation gaming will be used in teaching decision-making skills.

130. Physiological Ecology of Wildlife (5) I, Jacobsen
 Lecture—4 hours; discussion—1 hour. Prerequisite: course 110 (may be taken concurrently), or 111 or 120; Physiology 110 and Zoology 125 or the equivalent. A study of animal functions, adaptations, and ecological energetics of wildlife. Nutrition metabolism, thermoregulation, and productivity are emphasized as a pattern of relationships for understanding the distribution and abundance of wildlife in time and space.

136. Ecology of Waterfowl and Game Birds (3) II. Raveling
 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 odd-numbered years.

***140. Ecology and Evolution of Vertebrate Social Organization** (3) II. Lott
 Lecture—3 hours. Prerequisite: Zoology 2 and upper division ecology. Spacing, competition, cooperation, leadership, and grouping of wild vertebrates are described and analyzed as adaptive products of their evolutionary history and ecology. Minimal consideration is given to man and the other primates.

151. Wildlife Ecology (3) I, Howard
 Lecture—3 hours. Consideration of the ecology of wildlife species in man-disturbed environments, including ecological aspects of wild vertebrates in relation to reforestation, range management, and pollution; the relationship of wildlife to recreation and wetlands; and resource conservation in the human ecosystem.

152. Principles of Vertebrate Control (3) II. Howard
 Lecture—3 hours. Prerequisite: course 151 recommended. The philosophical, historical, ecological, behavioral, and economical basis for regulating population levels of species of terrestrial vertebrates found throughout the world.

153. Wildlife in Polluted Environments (3) II. Anderson
 Lecture—3 hours. Prerequisite: introductory courses in organic chemistry, ecology, statistics, and physiology; or consent of instructor. Environmental pollution in relation to vertebrate ecology, studies of the effects and mechanisms of various forms of pollution, review of instances of pollution-wildlife interaction, the ecological consequences, effects on individuals, philosophical considerations. Offered even-numbered years.

190. Proseminar in Wildlife and Fisheries Biology (1) I, II, III. The Staff (Raveling in charge)
 Seminar—1 hour. Prerequisite: senior standing in Wildlife and Fisheries Biology or consent of instructor. Reports and discussions of recent advances related to wildlife and fisheries biology. (P/NP grading only.)

192. Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge)
 Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn 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.)

198. Directed Group Study (1-5) I, II, III. The Staff (Raveling in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Raveling in charge)
(P/NP grading only.)

Graduate Courses

290. Seminar (3) I, II, III. The Staff (Raveling in charge)
Seminar—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.

291. Fish Ecology Seminar (2) II. Moyle
Seminar—2 hours. Prerequisite: graduate status or consent of instructor. Current research and advances in fisheries biology and fish ecology.

298. Group Study (1-5) I, II, III. The Staff (Raveling in charge)
Lectures and/or discussions—1-5 hours.

299. Research (1-12) I, II, III. The Staff (Raveling in charge)
(S/U grading only.)

Work-Learn Program

Orville E. Thompson, Ph.D., Program Director

Work-Learn and Career Planning and Placement Center
2nd Floor, South Hall (752-2855)

Program Areas

- Agricultural and Environmental Sciences*
Joe J. Stasulat, Ph.D., Program Coordinator
- Engineering and Physical Sciences*
Walter E. Buisi, Program Coordinator
- Health and Biological Sciences*
Linda Hughes, Program Coordinator
- Liberal Arts and Education*
Donald J. Hagerty, Program Coordinator

Internship Experience

This is a campus-wide internship program facilitated through the Work-Learn and Career Planning and Placement Center. All internships, both credit and non-credit, can be taken for *Transcript Notation* with completion of a required evaluation report. The notation briefly describes the nature and location of the internship experience. Questions pertaining to credit and Transcript Notation may be directed to the Work-Learn and Career Planning and Placement Office.

Courses in Work-Learn

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 Work-Learn staff.

NOTE: For key to footnote symbols, see page 130.

Zoology

(College of Letters and Science)

Robert D. Grey, Ph.D., Chairperson of the Department
John H. Crowe, Ph.D., Vice-Chairperson of the Department
Department Office, 2320 Storer Hall (752-1272)

Faculty

- Peter B. Armstrong, Ph.D., Professor
- Ronald J. Baskin, Ph.D., Professor (*Zoology, Physiology*)
- John H. Crowe, Ph.D., Professor
- David W. Deamer, Ph.D., Professor
- Carol A. Erickson, Ph.D., Assistant Professor
- Robert D. Grey, Ph.D., Professor
- Milton Hildebrand, Ph.D., Professor
- Everett W. Jameson, Jr., Ph.D., Professor
- Robert A. Metcalf, Ph.D., Assistant Professor
- Milton A. Miller, Ph.D., Professor Emeritus
- Brian Mulloney, Ph.D., Associate Professor
- Richard L. Nuccitelli, Ph.D., Assistant Professor
- David W. Phillips, Ph.D., Assistant Professor
- Lauren E. Rosenberg, Ph.D., Professor Emeritus
- Robert L. Rudd, Ph.D., Professor
- George W. Salt, Ph.D., Professor
- Arthur M. Shapiro, Ph.D., Professor
- Herman T. Spieth, Ph.D., Professor Emeritus
- Judy Stamps, Ph.D., Associate Professor
- Catherine A. Toft, Ph.D., Assistant Professor
- Charles Van Riper III, Ph.D., Adjunct Assistant Professor
- Kenneth E. F. Watt, Ph.D., LL.D., Professor
- Stephen L. Wolfe, Ph.D., Associate Professor

The Major Programs

The Zoology major presents animal biology from the subcellular and molecular to the community and ecosystem levels. As a basic life science major, it is suitable for students who plan to pursue a professional career in Zoology, to do graduate work in Zoology or another life science, or who intend to apply to professional schools in the health sciences. The major is structured to insure breadth of preparation while still allowing individualization of each student's program in accordance with his or her interests.

Students majoring in Zoology in the College of Letters and Science may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis.

Choice of College. The Bachelor of Arts degree is offered only in the College of Letters and Science. The Bachelor of Science degree is offered in both the College of Letters and Science and the College of Agricultural and Environmental Sciences.

Zoology

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	43-45
Chemistry 1A, 1B, 8A, 8B	16
Biological Sciences 1	5
Zoology 2-2L	6
Statistics 13 or 102	4
Mathematics 16A	3
Physics 2A, 2B	6
One course from Bacteriology 2, 102, Botany 2, Physics 2C	3-5

Depth Subject Matter	36-38
Genetics 100A-100B or 115 or 120	4-6
One course from Zoology 148, Genetics 103, Geology 107, 111A, Anthropology 151	3-5
Additional upper division coursework in biological science to achieve a total of 36 units or more	25-29
Include at least (a) 15 units in zoology, and (b) one course or course sequence from three of the five Areas of Study shown below.	
Total Units for the Major	79-83

Recommended

Geology 3; Biochemistry 101A-101B or Physiological Sciences 101A-101B.

Zoology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	55-61
Chemistry 1A, 1B, 1C	15
Chemistry 8A-8B or 128A-128B-128C	6-9
Biological Sciences 1	5
Zoology 2-2L	6
Mathematics 16A-16B or 21A-21B	6-8
Physics 2A, 2B, 2C	9
Statistics 13	4
One course from Bacteriology 2, 102, Botany 2	3-5

Depth Subject Matter

45-48	
Biochemistry 101A-101B or Physiological Sciences 101A-101B	6-7
Genetics 100A-100B or 115 or 120	4-6
One course from Zoology 148, Genetics 103, Geology 107, 111A, Anthropology 151	3-5
Additional upper division course work in biological science to achieve a total of 45 or more units	29-32
Include at least (a) 15 units in zoology, (b) 4 units (or 12 hours) of laboratory, and (c) one course or course sequence from four of the five Areas of Study shown below.	

Breadth Subject Matter

<i>College of Agricultural and Environmental Sciences students</i>	24
English and/or rhetoric	8
Social sciences and/or humanities	16
Additional requirements as described on page 70	

College of Letters and Science students:

Refer to page 93 for a description of requirements to be completed in addition to the major.

Total Units for the Major **100-109**

Recommended

Chemistry 5, Mathematics 16C or 21C, Geology 3.

Areas of Study

1. Ecology and behavior: Zoology 116, 125, 147, 149, 155.
2. Systematics, morphology, and natural history: Zoology 105, 106, 112A, 112B, 133A, 133B, 133L, 136, 136L, 137, 137L.
3. Cell biology: Zoology 121A, 121B, 121L, 166; Botany 130, 130L.
4. Developmental biology: Zoology 100, 100L, 101.
5. Physiology: Zoology 142, 142L, 143, 144, 166; Physiology 110, 110L.

Biological Sciences Electives

The following courses are acceptable toward the fulfillment of the upper-division biological sciences requirement in the 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 150, 151, 152, 153A, 153B, 154A, 154B, 155, 156
- Bacteriology, all upper division courses
- Biochemistry and Biophysics, all upper division courses
- Biological Sciences, all upper division courses
- Botany, all upper division courses
- Chemistry 107A, 107B
- Clinical Pathology 101, 101L, 102
- Entomology, all upper division courses except 110, 112
- Genetics, all upper division courses
- Geology 106, 106L, 107, 107L, 111A, 111B, 150C

Zoology

Nematology 110
Nutrition 110, 111, 111L, 114
Physiological Sciences 101A, 101B
Physiology, all upper division courses
Psychology 108, 129, 134, 150
Veterinary Microbiology 126, 126L, 128, 130, 132
Wildlife and Fisheries Biology 120, 121

Major Advisers. Students transferring to Davis from another institution and majoring in Zoology 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 Zoology Department Office for adviser assignment. A list of approved upper division courses for the Zoology major is available from the Department Office. Substitutions of other courses for major requirements are arranged through the adviser.

Preprofessional students should establish contact with the Health Sciences Advising Office, in 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 page 105 for the Teacher Education Program.

Graduate Study. The Department of Zoology offers programs of study and research leading to the M.A. and Ph.D. degrees. For detailed information regarding graduate study write to the Graduate Adviser, Department of Zoology.

Graduate Advisers. See *Class Schedule and Room Directory*.

Courses in Physiology

Lower Division Courses

2. Introductory Physiology (4) II. Nuccitelli
Lecture—4 hours. Prerequisite: Biological Sciences 1. Physiology of muscular contraction, nervous integration, sensation, circulation, respiration, excretion, and digestion.

2L. Introductory Physiology Laboratory (2) II. Nuccitelli
Laboratory—6 hours. Prerequisite: course 2 (completed or in progress).

10. Elementary Physiology (4) III. Deamer
Lecture—3 hours; discussion—1 hour. Prerequisite: not open for credit to students who have had Biological Sciences 1. Introductory course in physiology for nonscience majors.

Courses in Zoology

Lower Division Courses

2. General Zoology (4) I, Toft; II, Phillips; III, Stamps
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 strongly recommended. Survey of the diversity of animal life and the basic principles of adaptation, evolution, and integration in animals.

2L. Laboratory in General Zoology (2) I, Toft; II, Phillips; III, Stamps
Laboratory—6 hours. Prerequisite: course 2 (preferably taken concurrently). Laboratories on the diversity of animal life and basic principles of organismal biology. (P/NP grading only.)

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn experience off and on campus in all subject areas offered in the Department of Zoology. 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)
Directed study of a specific topic selected by the student and the instructor. (P/NP grading only.)

Upper Division Courses

100. Embryology (4) I, Armstrong; II, Grey; III, Erickson
Lecture—4 hours. Prerequisite: Biological Sciences 1 and courses 2-2L. concurrent enrollment in course 100L strongly recommended. Events and mechanisms of embryonic

development, including fertilization, morphogenesis, cell differentiation and organogenesis, with emphasis on vertebrates.

100L. Laboratory in Vertebrate Embryology (2) I, Armstrong; II, Grey; III, Erickson
Laboratory—6 hours. Prerequisite: course 100 (concurrently). Comparative analysis of the embryonic development of vertebrates. Limited enrollment. (P/NP grading only.)

101. Experimental Analysis of Animal Development (3) III. Grey, Armstrong
Discussion—1 hour; laboratory—6 hours. Prerequisite: courses 100, 100L; Biochemistry 101A, 101B; and consent of instructor. Principles and techniques of gamete procurement and embryo maintenance; applications of techniques such as microsurgery, tissue culture, and radioisotopic labeling to experimental study of developmental problems, with emphasis on sea urchins, amphibians, and chickens. Limited enrollment. Offered in even-numbered years.

105. Phylogenetic Analysis of Vertebrate Structure (5) II. Hildebrand
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 2. The structure of the classes and subclasses of vertebrates is described and interpreted in terms of phylogeny.

106. Functional Analysis of Vertebrate Structure (3) III. Hildebrand
Lecture—2 hours; laboratory-demonstration—4 hours. Prerequisite: course 2. Mechanical principles are used to interpret the structure associated with supporting the body, running, digging, climbing, swimming, flying, and feeding. Emphasis is on the skeletal system of mammals.

106P. Project on the Functional Analysis of Vertebrate Structure (1) III. Hildebrand
Project report. Prerequisite: course 106 (may be taken concurrently). A paper of about 2,000 words, or a dissection with explanation, analyzing the function of a selected aspect of vertebrate structure.

110. Principles of Environmental Sciences (4) II. Watt, Powell
Lecture—3 hours; discussion—1 hour. The principles basic to biological ecology, human ecology, and planning. (Same course as Environmental Studies 110.)

112A. Invertebrate Zoology (5) II. Mulloney
Lecture—3 hours; laboratory—6 hours; two field trips to the ocean. Prerequisite: course 2-2L. The structures, development, natural history and evolutionary history of the jellyfishes and corals, the unsegmented worms, the seastars, sea urchins, and the sea squirts, and their allies. Laboratories emphasize observation and comparison of living animals.

112B. Invertebrate Zoology (5) III. Phillips
Lecture—3 hours; laboratory—6 hours; Prerequisite: courses 2-2L. Phylogeny, morphology, and embryology of the protostomes.

***116. Principles of Animal Resource Management (5) I, Watt**
Lecture—3 hours; laboratory—3 hours; special projects. Prerequisite: Biological Sciences 1; Statistics 13; Mathematics 16A. Population dynamics and management of marine, freshwater, and terrestrial animal resources; analysis and solution of problems in maximization of animal resource production.

121A. Cell Biology (4) I, Nuccitelli
Lecture—4 hours. Prerequisite: introductory course in biochemistry. This is an introduction to cell biology emphasizing the membrane components of cells and the structure and function of sub-cellular organelles.

121B. Cell Biology (4) II. Wolfe
Lecture—4 hours. Prerequisite: introductory course in biochemistry. This is an introduction to cell biology which concentrates on the nucleus and covers recent findings related to DNA, RNA, protein synthesis and molecular biology.

121L. Cell Biology Laboratory (3) II. Baskin, Deamer
Lecture—1 hour; laboratory—6 hours. Prerequisite: Biochemistry 101A-101B required. Course 121A-121B recommended, or consent of instructor. Exercises illustrating the principles of cell biology; emphasis on individual research employing one or more advanced techniques.

122. Histology (4) III. Crowe
Lecture—3 hours; laboratory—2 hours. Prerequisite: course 121A; working knowledge of elementary Physiology is essential. Functional morphology of animal tissues and organs. Emphasis is placed on the use of structural studies in elucidating mechanisms underlying physiological and metabolic processes.

122L. Histology Laboratory (3) III. Crowe
Laboratory—6 hours. Prerequisite: course 122 (may be taken concurrently). Laboratory practice in histo- and cyto-techniques; use of such techniques in research. Design and execution of a research project is required.

***125. Animal Ecology (3) I, Salt; II, Toft**
Lecture—3 hours. Prerequisite: courses 2-2L. A general survey of the concepts of animal ecology.

133A. Patterns in Vertebrate Biology (3) II. Jameson
Lecture—3 hours. Prerequisite: course 2. Introduction to phylogeny, distribution, skin and color, senses and communication and breathing in vertebrates.

133B. Patterns in Vertebrate Biology (3) III. Jameson
Lecture—3 hours. Prerequisite: course 2. Vertebrate biology with respect to thermo-regulation and water balance, seasonal dormancy, migration, food, reproduction and population.

133L. Systematics and Field Studies in Cold-Blooded Vertebrates (3) III. Jameson
Laboratory—6 hours; field trips. Prerequisite: course 133 and consent of instructor. Systematic and faunal studies on poikilothermous vertebrates.

136. Mammalogy (2) I, Rudd
Lecture—2 hours. Prerequisite: course 125 or equivalent general course in ecology. Systematics, life history, reproduction, distribution and physiology of wild mammals.

136L. Mammalogy Laboratory (3) I, Rudd
Laboratory—6 hours; extensive weekend field-trips. Prerequisite: course 125, or 136 and consent of instructor. Systematics of Californian mammals; techniques of study in professional mammalogy. May be taken concurrently with course 136.

137. Ornithology (2) III. Rudd
Lecture—2 hours. Prerequisite: course 125 or the equivalent course in ecology. Systematics, distribution, physiology, and population dynamics of birds.

137L. Ornithology Laboratory (3) III. Rudd
Laboratory—6 hours. Prerequisite: course 125 or 137 (may be taken concurrently) and consent of instructor. Systematics, behavior, population dynamics and reproduction of California birds. Individual study and field trips strongly emphasized.

138. Ecology of Tropical Latitudes (3) II. Rudd
Lecture—3 hours. Prerequisite: courses 2-2L or the equivalent; general course in introductory ecology recommended. Physical and biological aspects of tropical zones. Distributions, number, ecological and evolutionary relationships of tropical animals.

141. Principles of Systematic Zoology (3) I, Shapiro
Lecture—2 hours; biweekly research projects. Prerequisite: course 2, 14B, or Genetics 103 recommended. Historical background, philosophical rationale, contemporary approaches, and working rules of animal biosystematics, including International Code of Zoological Nomenclature.

142. Invertebrate Physiology (4) II. Crowe
Lecture—3 hours; term paper; individual conferences. Prerequisite: either course 112A or 112B, Chemistry 1A, 1B, Physics 2B; Biochemistry 101A, 101B recommended. Comparative physiology of invertebrate organ systems.

142L. Invertebrate Physiology Laboratory (3) II. Crowe
Laboratory—6 hours (includes research project). Prerequisite course 142 (may be taken concurrently). Experiments on the physiological mechanisms of invertebrate organ systems. Designs and execute of a research project.

143. Cellular and Developmental Neurobiology (4) I, Mulloney
Lecture—3 hours; extensive reading. Prerequisite: course 2-2L; Biochemistry 101A-101B or the equivalent. Neuronal structure; impulse transmissions; synapses; transmitters and transmitter pharmacology; receptors; growth and differentiation of neurons and nervous systems; genetics of behavior. Only three units of credit allowed students who have received credit for course 144. Offered in odd-numbered years.

143L. Neurobiology Laboratory (4) I, Mulloney
Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: course 143 or 144 and consent of instructor; Physics 2B recommended. Students will learn to record action potentials and synaptic circuits, to interpret quantitatively their recordings, and to use vital dyes and intracellular stains. Limited enrollment.

144. Cellular Basis of Behavior (4) I, Mulloney
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 2-2L. Neurons and nervous systems, sensory systems, centrally-generated behavior; sensory modulation of behavior; analysis of neural substrates of stereotyped behavior; long-term changes in CNS. Only three units of credit allowed students who have received credit for course 143.

147. Zoogeography (4) I, Jameson
Lecture—3 hours. Prerequisite: courses 2-2L or Entomology 100. Movements of terrestrial animals. The role of geographic, climatic, and biologic changes in the geographic distribution of animals.

148. Animal Phylogeny and Evolution (4) II. Metcalf
Lecture—4 hours. Prerequisite: course 2 or the equivalent and Genetics 100; ecology and biochemistry recommended. Introduction to current evolutionary theory. The place of evolution as the central unifying theory to biology will be emphasized.

149. Evolution of Ecological Systems (4) II. Shapiro
Lecture—3 hours; term paper. Prerequisite: course 125 or Environmental Studies 100 (or the equivalent) and course 148 or Genetics 103 (or the equivalent). Evolution as an organizing force in natural communities. Coadaptation in trophic and competitive relationships. Ecology of polymorphisms, clines, and speciation.

155. Behavior of Animals (5) II. Stamps
Lecture—3 hours; discussion—1 hour; term paper. Basic principles, mechanisms and evolution of behavior, with special reference to the significance of behavior under natural conditions.

158. Evolution of Behavior (3) I, Metcalf
Lecture—3 hours. Prerequisite: course 148, Genetics 103, or consent of instructor; course in population genetics strongly recommended and basic course in behavior, ecology, and physiology recommended. Current interpretations of the adaptive significance of behavioral patterns and the mechanisms of their evolution. Emphasis on the genetic basis of behavioral evolution through examination of data and theoretical models.

166. Advanced Cell Biology (4) III. Baskin
Lecture—3 hours; extensive reading and research report. Prerequisite: Biochemistry 101B and Mathematics 16B. The physical-chemical basis of cell structure and function, including a discussion of aspects of biological thermodynamics, the ionic basis of excitation, and the molecular basis of contractility.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in all subject areas offered in the Department of Zoology. Internships supervised by a member of the faculty. (P/NP grading only.)

197. Senior Colloquium in Zoology (2) III. The Staff
Lecture-discussion—2 hours. Prerequisite: senior standing. The consideration of innovation and synthesis in broad areas of zoology. (P/NP grading only.)

197T. Tutoring in Zoology (1-5) I, II, III. The Staff (Chairperson in charge)
Discussion—1-2 hours. Prerequisite: major in zoology; consent of instructor. Experience in teaching zoology under guidance of staff. (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)
Directed study of a specific topic selected by the student and the instructor. (P/NP grading only.)

Graduate Courses

202. Biomathematics (6) III. Watt
Lecture—4 hours; laboratory—6 hours. Prerequisite: two courses in calculus; three courses in statistics. Mathemat-

ical aspects of physiology, ecology, and epidemiology; development and testing of models, mathematical description of biological systems; measurement, analysis, simulation and optimization in biology. Offered in odd-numbered years.

203. Global and Regional Modelling (6) III. Watt
Lecture—1 hour; discussion—1 hour; seminar—3 hours; laboratory—3 hours. Prerequisite: Mathematics 16A-16B; Statistics 106 and 108 or 131A-131B-131C; FORTRAN. Use of statistical analysis of data, mathematical modeling, and computer simulation of the world or regions to provide basis for policy recommendations and new legislation. Offered in even-numbered years.

204. Cellular Basis of Morphogenesis (4) I, Armstrong
Lecture—3 hours; term paper. Prerequisite: course 100. Development of form and structure; morphogenetic movement, mechanisms of cellular motility, cell adhesion, intercellular invasion, interaction of cells and tissues in development.

224. Developmental Biology (3) III. Erickson
Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: course 100 and consent of instructor; Biochemistry 101 recommended. Introduction to research in development. Observations and experiments involving a variety of developing systems and experimental methods, with critical interpretation of the results. Open to qualified undergraduates. Offered in odd-numbered years.

225. Biology of Fertilization (3) III. Grey
Lecture—2 hours; term paper. Prerequisite: course 121A or the equivalent and consent of instructor. The morphology, physiology and biochemistry of gametes and the mechanism and consequences of their union. Offered in even-numbered years.

226. Cellular Biology of the Malignant Transformation (1) II. Armstrong
Lecture—1 hour. Prerequisite: course 100; course 121A or 121B or Biochemistry 101A and 101B. Topics include: factors causing the malignant transformation of cells, control of growth of tissue cells (and loss of control in transformed cells), mechanisms of intercellular invasion, natural defense mechanisms against transformed cells. Emphasis is at the cellular and molecular levels.

228. Experimental Animal Ecology (3) III. Salt
Lecture—2 hours; 3 weekend field trips, 2 written critiques. Prerequisite: course in animal ecology. Discussion of means of generating ecological hypotheses and methods of testing those hypotheses. Topics will include analysis of field observation, experimental design in both field and laboratory, and interpretation of results. Limited enrollment.

236. Muscle Physiology (4) I. Baskin
Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: Biochemistry 101A-101B and Mathematics 16B or 21B; or consent of instructor. The physical and chemical aspects of muscle function.

240. Topics in Cell Biology (3) I, Baskin, Deamer
Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Discussion and review of current topics in the area of cell biology. May be repeated for credit.

241. Membrane Biology (3) I, Deamer
Lecture—3 hours. Prerequisite: course 121A-121B or Biochemistry 101A-101B recommended, or consent of instructor. Course emphasizes 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 odd-numbered years.

243. Topics in Cellular and Behavioral Neurobiology (2) III. Mulloney
Seminar—2 hours. 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.)

266. Seminar in Cell Biology (2) I, Wolfe; II, Baskin
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 on the molecular and cellular levels of biological systems.

269. Research Conference in Developmental Biology (1) I, II, III. Armstrong, Grey, Erickson
Seminar—2 hours. Prerequisite: consent of instructor. Presentation and critique of faculty and graduate student research in developmental biology. Intended primarily for graduate students. (S/U grading only.)

287. Seminar in Animal Behavior (2) II. Stamps
Seminar—2 hours. Prerequisite: consent of instructor. Reports and discussion on the principles and recent developments in invertebrate and vertebrate animal behavior.

292. Seminar in Development (2) II. Armstrong, Grey, Erickson, Nuccitelli
Seminar—3 hours. Prerequisite: consent of instructor. Reports and discussion on embryology, morphogenesis, and developmental mechanisms.

293. Seminar in Invertebrate Zoology (2) II. Crowe
Seminar—2 hours. Prerequisite: either course 112A or 112B, or consent of instructor. Critical review of the literature in selected topics and taxa in the invertebrata. Open to qualified undergraduates.

294. Seminar in Animal Ecology (3) I. Rudd, Salt
Seminar—3 hours. Prerequisite: course 125 and graduate standing. Readings and discussions of advanced topics in the population and community ecology of animals.

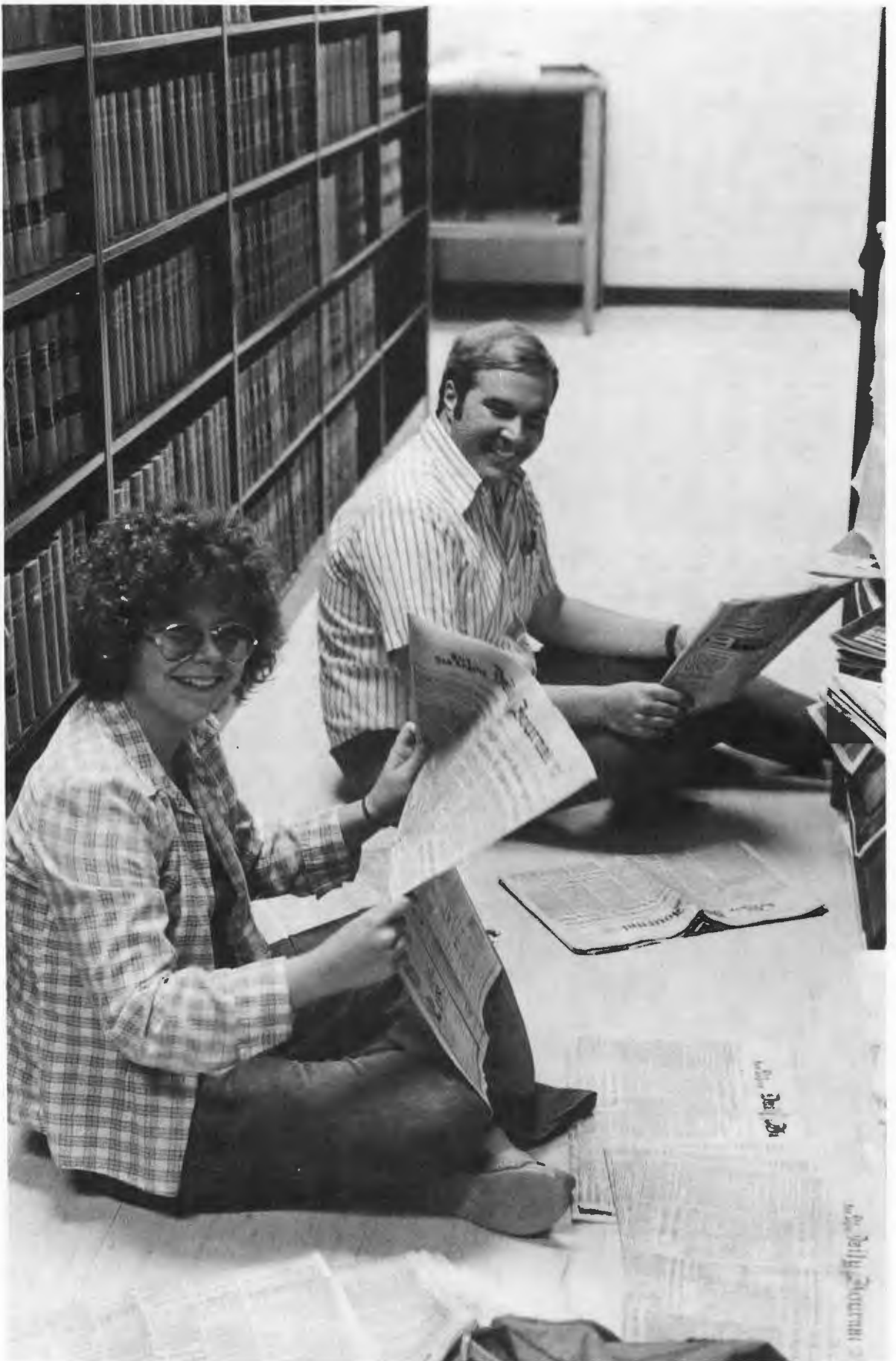
295. Seminar in Marine Invertebrate Ecology (2) I, Phillips
Seminar—2 hours. Prerequisite: course 112A or 112B; consent of instructor. Reports and discussions on current topics in marine invertebrate ecology. Open to qualified undergraduates.

296. Seminar in Geographical Ecology (2) I, Shapiro
Seminar—2 hours. Prerequisite: course 125 or 148 or Genetics 103 or consent of instructor. Recent developments in theoretical and experimental biogeography, the biology of colonizing species, and related topics.

***297. Seminar in Systematic Zoology and Evolution** (2) III. Rudd
Seminar—2 hours. Prerequisite: consent of instructor. Principles of animal classification, speciation and the evolution of higher categories; emphasis on modern concepts and pertinent contributions from the fields of genetics and paleontology.

298. Group Study (1-5) I, II, III. The Staff
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Grey in charge)
(S/U grading only.)



Appendix

STATEMENT ON LEGAL RESIDENCE AT THE UNIVERSITY OF CALIFORNIA

Each new student entering the University of California (and each former student returning after an absence of one or more quarters) is required to submit a Statement of Legal residence to the Office of the Registrar. This Statement is used by the Deputy to the Attorney in Residence Matters in determining the legal residence of each student for fee assessment purposes.

Students who have not been legal residents of California for more than one year immediately prior to the residence determination date for each quarter in which they propose to attend the University are charged, along with other fees, a tuition fee of \$800 for the quarter.

The residence determination date is the day instruction begins at the last of the University of California campuses to open for the quarter.

Establishing Legal Residence for Tuition Purposes

In order to be classified as a resident for tuition purposes at the University of California, an adult student must have established his or her residence in California for more than one year immediately preceding the residence determination date for the term during which he or she proposes to attend the University and have relinquished any prior residence. An adult student must couple his or her physical presence within this state for one year with objective evidence that such presence is consistent with his or her intent in making California his or her permanent home and, if these steps are delayed, the one-year durational period will be extended until BOTH presence and intent have been demonstrated for one full year. Indeed, physical presence within the state solely for educational purposes does *not* constitute the establishment of California residence under State law regardless of the length of his or her stay in California.

Relevant indicia which can be relied upon to demonstrate one's intent to make California his or her permanent residence include, but are not limited to, the following: registering and voting in California elections; designating California as his or her permanent address on all school and employment records, including military records if one is in the military service; obtaining a California driver's license or California Identification Card, if a non-driver; obtaining California vehicle registration; paying California income taxes as a resident, including income earned outside this state; establishing an abode where one's permanent belongings

are kept within California; licensing for professional practice in California; and the absence of these indicia in other states during any period for which residence in California is asserted. Documentary evidence may be required. No single factor is controlling or decisive. All relevant indicia will be considered in the classification determination.

The student must petition to have his or her status changed at the Office of the Registrar at the campus attended, and documentation of residence (driver's license, voter registration receipt, etc.) may be requested at that time. All changes of status must be initiated prior to the late registration period for the quarter or semester for which the student intends to be reclassified.

The residence of the parent with whom an unmarried minor (under age 18) child maintains his or her place of abode is the residence of the unmarried minor child. When the minor lives with neither parent his or her residence is that of the parent with whom he or she maintained his or her last place of abode. The minor may establish his or her residence when both parents are deceased and a legal guardian has not been appointed. The residence of an unmarried minor who has a parent living cannot be changed by his or her own act, by the appointment of a legal guardian, or by relinquishment of a parent's right of control.

A man or a woman establishes his or her residence. A woman's residence shall not be derivative from that of her husband, or vice versa.

The student is cautioned that this summation is not a complete explanation of the law regarding residence. The student should also note that the rate of nonresident tuition and the residence requirements are subject to change. Regulations have been adopted by The Regents, a copy of which is available for inspection in the Registrar's Office of the campus.

Those classified incorrectly as residents are subject to reclassification and to payment of all nonresident fees not paid. If incorrect classification results from false or concealed facts (by the student), the student also is subject to University discipline. Resident students who become nonresidents must immediately notify the Attorney in Residence Matters' Deputy.

Inquiries from prospective students regarding residence requirements for tuition purposes should be directed to the Attorney in Residence Matters, 590 University Hall, 2200 University Avenue, Berkeley, California 94720. No other University personnel are autho-

alized to supply information relative to residence requirements for tuition purposes. Any student, following a final decision on residence classification by the Residence Deputy, may make written appeal to the Attorney in Residence Matters at the above address within 120 days after notification of the final decision by the Residence Deputy.

Exceptions

1. A minor student who remains in this state after his or her parent, who was a resident of California for at least one year immediately prior to leaving but has established residence elsewhere shall be entitled to retain resident classification if the student enters the University within one year after the parent moves, so long as continuous attendance is maintained at the University.
2. Nonresident students who are minors or 18 years of age who can show that they have been totally self-supporting through employment and actually present within California for the entire year immediately prior to the residence determination date and have demonstrated the intent to make California their permanent home may be eligible for resident status.
3. A student shall be entitled to resident classification if immediately prior to the residence determination date he or she has lived with and been under the continuous direct care and control of any adult other than a parent for not less than two years, provided that the adult having such control has been a California resident during the year immediately prior to the residence determination date. This exception continues until the student has attained the age of majority and has resided in the state the minimum time necessary to become a resident student, so long as continuous attendance is maintained at an institution. No support can be given the student by either parent.
4. Exemption from payment of the nonresident tuition fee is available to the natural or adopted child, step-child or spouse who is a dependent of a member of the United States military stationed in California on active duty. Such resident classification may be maintained until the student has resided in California the minimum time necessary to become a resident. If a student is enrolled in an institution and the member of the military is transferred on military orders to a place outside the United States immediately after having been on active duty in California, the student is entitled to retain resident classification under conditions set forth above.
5. A student who is a member of the United States military stationed in California on active duty, except a member of the military assigned for educational purposes to a state-supported institution of higher education, shall be entitled to resident classification until he or she has resided in the state the minimum time necessary to become a resident.
6. Alien students who (1) have been admitted to the United States for permanent residence and who have resided in California for a year after such admission, (2) are minors who have been admitted to the United States for permanent residence and whose parent(s)

have been admitted to the United States for permanent residence and have resided in California for one year after such admission, (3) are refugees who have been granted parole, conditional entrant or indefinite voluntary departure status and who have resided in California for one year (effective until June 30, 1981), and (4) hold certain nonimmigrant visa classifications may be entitled to resident classification. For complete information, please contact the Residence Deputy in the Registrar's Office.

7. Children of deceased public law enforcement or fire suppression employees, who were California residents and who were killed in the course of law enforcement or fire suppression duties, may be entitled to resident status.

Waivers Of Nonresident Tuition

To the extent funds are available, nonresident tuition waivers may be granted to spouses and dependent, unmarried children under age 21 of University faculty members who are qualified for membership in the Academic Senate; to unmarried, dependent children under age 21 of a full-time University employee whose permanent assignment is outside California and who has been employed by the University for more than one year immediately prior to the opening of the term. Inquiries regarding these waivers normally should be directed to the Deputy in Residence Matters, Registrar's Office, of the campus the student proposes to attend.

In addition, certain student Teaching Assistants and Teaching Fellows, and certain graduate students designated as University Fellows and distinguished Scholars may be eligible for nonresident tuition waivers or fellowships. Such students should contact the Graduate Division at their campus for further information.

DISCLOSURE OF STUDENT RECORDS

In accordance with the Federal Family Educational Rights and Privacy Act of 1974 and the **University of California Policies Applying to the Disclosure of Information from Student Records**, students at the University have the right:

- To inspect and review records pertaining to themselves in their capacity as students;
- To have withheld from disclosure, absent their prior consent for release, personally identifiable information from their student records, with exceptions as noted in Section 10.72 of the Policies.
- To inspect records maintained by the campus of disclosure of personally identifiable information from their student records;
- To seek correction of their student records through a request to amend the records or a request for a hearing; and
- To file complaints with the Department of Health, Education and Welfare regarding 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 for Student Records."

Questions about these rights should be referred to Bob Franks, Office of Student Activities and Conduct, telephone 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 and Policy and Procedure Manual Section 320-21 may be obtained at the Office of Student Activities and Conduct.

Categories of *personally identifiable information* designated by the campus as public information are: name, address, telephone listing, date and place of birth, major field of study, dates of attendance, degrees and honors received, the most recent educational institution attended, participation in 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.

Students may request, in writing, by the last day of registration, that any 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 Data Card included in the registration packet. Students who desire to withhold any other item of information in the list from the category of public information must file a form in the Registrar's Office indicating which items they wish withheld.

Students availing themselves of this right should understand what the consequences of this action may be. For example, if a request is made to withhold from disclosure a student's name and degrees and honors received, 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 written consent of the student. Similarly, if a request is made to withhold from disclosure a student's name and dates of attendance, a student's status as a student cannot be verified for potential employers without written consent of the student. Furthermore, if a student's last instruction to the campus was to withhold from disclosure the degree granted to that student and the date on which the degree was conferred, that information cannot be confirmed for a 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 of a previous quarter at registration for a new quarter on the student data form, or at any time by filing a form with the Registrar's Office indicating which items they now wish released.

RETENTION DATA¹ AND GRADUATION RATES AT UCD**Freshmen**

(Retention and graduation rates for regularly admissible undergraduates entering UCD as freshmen.)

Fall Quarter of Initial Enrollment	Number of Students	Percent Enrolled in 4th Quarter	*Percent Graduating in	
			4 Years	5 Years
1971	1,801	85%	40%	59%
1972	1,959	85%	39%	60%
1973	1,940	86%	36%	60%
1974	2,004	84%	31%	—

Transfer Students

(Retention and graduation rates for regularly admissible undergraduates transferring to UCD as juniors.)

Fall Quarter of Initial Enrollment	Number of Students	Percent Enrolled in 4th Quarter	*Percent Graduating in	
			2 years	3 years
1972	1,159	79%	43%	71%
1973	1,261	78%	42%	67%
1974	1,193	75%	39%	64%
1975	1,253	76%	39%	67%
1976	1,006	76%	31%	—

* These are not necessarily years of *continuous* enrollment. Students may drop out or go on Planned Educational Leave for a quarter or longer, and then resume their studies.

¹ Source: Research and Evaluation, University of California, Davis (March 1980).

PROPORTION OF UCD GRADUATES FINDING WORK IN THEIR FIELD OF CHOICE¹

The percent of UCD alumni whose full-time job is in the field of their choice is shown by field of study and number of years since receiving the bachelor's degree.

Years Since Graduation	Field of Study ²									
	Animal Science	Applied Economics	Food Science	Plant Science	Bio- science	Resource Science	Engineering	Humanities	Physical Science	Social Science
	-----proportion finding work in field of choice-----									
1 year	66	78	79	76	51	65	88	47	76	49
4 years	73	75	87	65	71	85	95	59	94	71

¹ Source: A 1977 survey of 1976 UCD graduates conducted by Student Affairs Research and Evaluation, University of California, Davis.

² Fields of study are a group of related undergraduate majors: for example, "Animal Science" would include such majors at UCD as Animal Science, Avian Sciences, and Wildlife and Fisheries Biology.

**SALARY AND EMPLOYMENT INFORMATION
AVERAGE MONTHLY SALARY OFFERS TO GRADUATES WITH BACHELOR'S,
MASTER'S, AND DOCTORATE DEGREES¹**

Field of Study	Average Monthly Salary		
	Bachelor's	Master's	Doctorate
Agricultural Sciences	\$1,162	\$ —	\$ —
Biological Sciences	1,183	—	—
Business	1,232	1,566	—
Chemistry	1,332	1,662	2,079
Computer Science	1,483	1,697	—
Engineering	1,667	1,823	2,382
Health Professions	1,062	—	—
Humanities	983	944	—
Mathematics/Statistics	1,356	1,689	1,875
Physical and Earth Sciences	1,473	1,899	—
Social Sciences	982	1,172	—

¹ Source: A 1980 national survey of a representative group of colleges and universities conducted by the College Placement Council. It should be noted that a wide variation in starting salaries exists within each discipline based on job location, type of employer, personal qualifications of the individual, and employment conditions at the time of job entry.

OTHER USEFUL PUBLICATIONS

Undergraduate Admissions Circular

A complete statement of the University's requirements for admission as an undergraduate.

Office of Undergraduate Admissions, 175 Mrak Hall, or from your high school or community college counselor. (No charge.)

Answers for Transfers

A question-and-answer booklet for students who want to attend a community college before transferring to the University. Gives information about University admission requirements, costs, financial aid, and advice on planning your program and transferring courses to UC.

Available from University Admissions Offices and Relations with Schools Offices, and at community college counseling offices. (No charge.)

29 Questions and Answers about UC Davis

Some answers to commonly asked questions about UCD.
Office of Undergraduate Admissions, 175 Mrak Hall. (No charge.)

Announcement of the Graduate Division, UC/Davis

Brief descriptions of the graduate programs and research resources including admission requirements, procedures and dates for filing applications, degrees offered, fields of study, degree requirements, fees and expenses, financial aid and student services, and sources of additional information. Course descriptions are not included.

Dean of the Graduate Division, 252 Mrak Hall. (No charge.)

College of Engineering Bulletin

A detailed description of College of Engineering programs, majors, and course offerings.

College of Engineering Dean's Office, 2120 Bainer Hall. (No charge.)

Graduate School of Administration Bulletin

Admission requirements, description of academic programs, courses of instruction, faculty, and general information. School of Administration, 111 Voorhies Hall, University of California, Davis 95616. (No charge.)

School of Law Bulletin

A detailed description of admissions requirements, academic programs, courses of instruction, faculty, law school activities, and general information about the School of Law.

Office of Admissions, School of Law, University of California, Davis 95616. (No charge.)

School of Medicine Bulletin

A detailed description of academic programs, courses of instruction, faculty, student activities, admissions requirements, and general information about the School of Medicine.

Office of Admissions, School of Medicine, University of California, Davis 95616. (No charge.)

Class Schedule and Room Directory

Issued quarterly. Lists times and place of meeting for specific classes, instructors, and units of credit. Also contains information on registration and enrollment in classes.

Available for 25 cents at the UCD Bookstore. (Not available by mail.)

Summer Sessions Bulletin

Complete information about Summer Session courses and instruction.

Office of the Summer Sessions, 375 Mrak Hall. (No charge.)

Educational Opportunity Program (EOP) Brochure

Information on applying to the EOP program; application dates.

EOP, Office of Admissions, 175 Mrak Hall. (No charge.)

Financial Aid Handbook

Information on financial aid: grants, loans, and work-study at UCD.

Financial Aid Office, North Hall. (No charge.)

Student Viewpoint

Student-compiled evaluations of courses and professors by in-class surveys, *ASUCD Catalog* of student services and organizations and *Student Directory* of student names, addresses and phone numbers.

Student Viewpoint Office, 13 Lower Freeborn. (No charge. Available by mail.)

Venture

University Extension quarterly catalog. Complete information about Unex courses, including times and locations.

University Extension, 4445 Chemistry Addition. (No charge.)

City of Davis Information

Chamber of Commerce, 620 4th Street, Davis, CA 95616.

GLOSSARY

- Academic Senate** The faculty governing body of the University. Consists primarily of the regular faculty and certain administrative officers. Determines conditions for the admission of students and for granting certificates and degrees; develops educational policy; and authorizes and supervises all courses in the University.
- Academic year** Starts at the beginning of the Fall Quarter, ends at the close of the Spring Quarter; does not include Summer Sessions.
- Advanced degree** Any degree beyond the bachelor's degree.
- AOB** Stands for "Academic Office Building," a building that houses administrative and academic offices. AOB is the informal designation until the building is officially named.
- ASUCD** (Associated Students of the University of California, Davis) The undergraduate student body governing organization at UCD.
- College** A subdivision of the campus instructional system (e.g., College of Letters and Science). The Colleges are further divided into departments (e.g., English, Zoology, etc.) which offer specialized curricula.
- Continuing student** One who was registered for the immediately preceding quarter.
- Credential** A license for public school teaching in California. Programs offering the multiple-subject (elementary) or single-subject (high school) teaching credential are supervised by the Graduate Division in coordination with the Department of Education.
- Curriculum** (plural, curricula) All the courses of study offered by the University. May also refer to a particular course of study (major) and the courses in that area.
- Drop/Add Petition** A petition used when you want to drop, change or add a course to your study list.
- Enrollment** The actual placing of a student in classes; to be on record as officially registered in a class.
- Good standing** An undergraduate student who has at least a 2.0 grade-point average in all work completed at the University of California, and who has maintained his or her minimum unit progress requirement for UCD, is considered a student in good standing.
- Grade-point average (GPA)** The GPA is computed in the following manner. You receive a certain number of points for each grade received. An "A" grade is worth 4 points, a "B" worth 3, a "C" worth 2, "D" worth 1, and an "F" worth 0. The total number of points accumulated is then divided by the number of course credits taken for a letter grade. The result is the grade-point average. Passed, Not Passed, or Incomplete grades are not computed in the quarterly grade-point average. (Exception: Incompletes are counted as "F" at the end of a student's undergraduate studies when determining whether a bachelor's degree candidate has achieved the required 2.0 average.) Only grades received for courses completed at the University of California are computed.
- Graduate student** A student who is enrolled in the Graduate Division for an advanced degree. Graduate courses at UCD are numbered 200-499.
- GSA** (Graduate Student Assembly) The elected representative body for graduate students at UCD.
- Independent studies** Special courses involving independent work supervised by a faculty member. Such courses for undergraduates are numbered 98, 99, 198, and 199. Those for graduate students are numbered 298, 299, 398, 399, 498, and 499. These courses are restricted to qualified students for a designated number of units.
- International student** A student enrolled in nonresident status who is a citizen or resident of another country.
- Lower Division** Freshman and sophomore standing at UCD (fewer than 84 units completed); also refers to UCD courses numbered from 1 through 99.
- Major** The area of academic concentration in which the degree is conferred.
- Matriculate** To enroll for a degree in a college or school.
- Minimum progress** Refers to the number of units a student must have completed and passed by the end of a specific number of quarters at UCD.
- New student** A student beginning work at any level at UCD is considered to be a new student. After one quarter's attendance at Davis, a student is considered to be a continuing student. Graduate students who were enrolled at UCD as undergraduates are considered to be new students for their first quarter of graduate work.

- Part-time student** A student enrolled in the Part-Time Degree Program.
- Passed/Not Passed (P/NP)** A system used to encourage undergraduate students to experiment in fields outside of their major areas. The "P" grade is given for a grade of C- or better. P/NP grades are not included in a student's grade-point average, but the units are counted toward the 180-unit graduation requirement.
- Petition** A request, usually written on a standard form, to adjust a study list or curriculum to fit an individual situation. Also, a request for an exception to a policy or regulation.
- Prerequisite** A necessary condition for enrollment in a course or a major. Prerequisites for courses usually consist of a previous course or courses in a related subject and/or the instructor's permission. Prerequisites are indicated in the course descriptions.
- Professional school student** A student enrolled in the School of Law, Administration, Medicine, or Veterinary Medicine.
- Probation** An indication that performance is below standard because of academic deficiencies; a trial period in which a student is permitted to redeem failing grades or deficient units.
- Quarter** A subdivision of the academic year at UCD, consisting of three 10-week terms (Fall, Winter, and Spring Quarters). The two 6-week Summer Sessions provide a quarter's work in a more concentrated format, but are not considered regular quarters. (Attendance at both Summer Sessions, however, may count as one quarter in residence.)
- Quarter units** Academic work at the University is measured by quarter units of credit which determine the amount of time a student has formally devoted to a given subject. To convert these units to semester units multiply by 2/3; from semester to quarter units multiply by 3/2.
- Registration** The process by which a student informs the University that he or she plans to begin attendance or continue attendance. Registration typically involves paying fees and enrolling in classes.
- Registration card** (sometimes called a "reg card") Given to a student who is registered and has paid all fees for the current quarter. You will need your registration card to secure grades, gain student admittance to campus events, and to identify yourself as a UCD student. If you lose your registration card there is a \$3 replacement fee.
- Regular session** Refers to Fall, Winter, and Spring Quarters. Students in the School of Medicine also attend a Summer Quarter.
- Residence** This word is used in a number of senses in this catalog; care must be taken to determine the meaning of the word each time it is used: (1) to denote registration in a regular session (i.e., when a student is "in residence" during Fall, Winter, or Spring Quarters); (2) to denote the period of time that a student must be registered at UCD in order to be eligible for graduation (i.e., academic residence); (3) to denote a student's state of residence (e.g., California) to determine if non-resident tuition must be paid (i.e., legal residence); (4) to indicate the student's place of residence (i.e., living quarters).
- Sabbatical** A leave of absence granted to a University professor for travel, research, etc. May be from one quarter to a full year.
- Satisfactory/Unsatisfactory** The equivalent of Passed/Not Passed for graduate students. The "S" grade is given for a grade of B- or better in graduate courses and C- or better in undergraduate courses.
- Semester** A subdivision of the academic year into two sessions, usually Fall and Spring, each lasting approximately 18 weeks. Only the School of Law uses the semester system at UCD. To convert semester units to quarter units, multiply by 3/2.
- Study List** The official program of courses for which a student registers. The Study List is submitted to the Registrar at the time of registration each quarter. In the College of Agricultural and Environmental Sciences, the Study List also refers to a student's long-term academic plan.
- Subject A** The University's requirement in English composition which must be completed to receive the bachelor's degree.
- Summer Sessions** Two 6-week summer sessions are offered between the close of Spring Quarter and the opening of Fall Quarter. Regular instruction, both undergraduate and graduate, is offered for full credit.
- TA (Teaching Assistant)** TA's are graduate students, usually on the doctoral level, who teach on a part-time basis while pursuing their degrees. They are selected, trained, and supervised by senior faculty members in each department.
- TB** Stands for "temporary building," usually a trailer or pre-fabricated building not intended as a permanent facility.
- TBA** Stands for "to be announced." In the *Class Schedule and Room Directory* course listings, TBA may refer to class meeting time, instructor's name, or room number for class meeting.
- Tenure** Denotes security of employment until retirement; may be granted to a faculty member after a specified number of years at the University.
- Term** A regular quarter (Fall, Winter, or Spring).
- Transcript** An official copy of your academic record (grades) at an educational institution such as the University of California.
- Undergraduate** A college student who is pursuing a bachelor's degree.
- Unit** Courses are assigned a unit value based on one unit of credit for every three hours of work (in-class and preparation time) per week by the student. A student's progress in the University and class level are determined in part by the number of units completed.
- Upper Division** Junior and senior standing at UCD, based upon completion of at least 84 units; also refers to UCD courses numbered 100-199.
- Work-Learn** A program providing on-the-job experience in a student's field of interest. Participation may be full time (during the summer or academic year) or part time, and may be paid or volunteer. Academic credit may also be earned.
- Work-Study** A financial aid program which provides eligible students with part-time jobs on campus or with off-campus nonprofit organizations.

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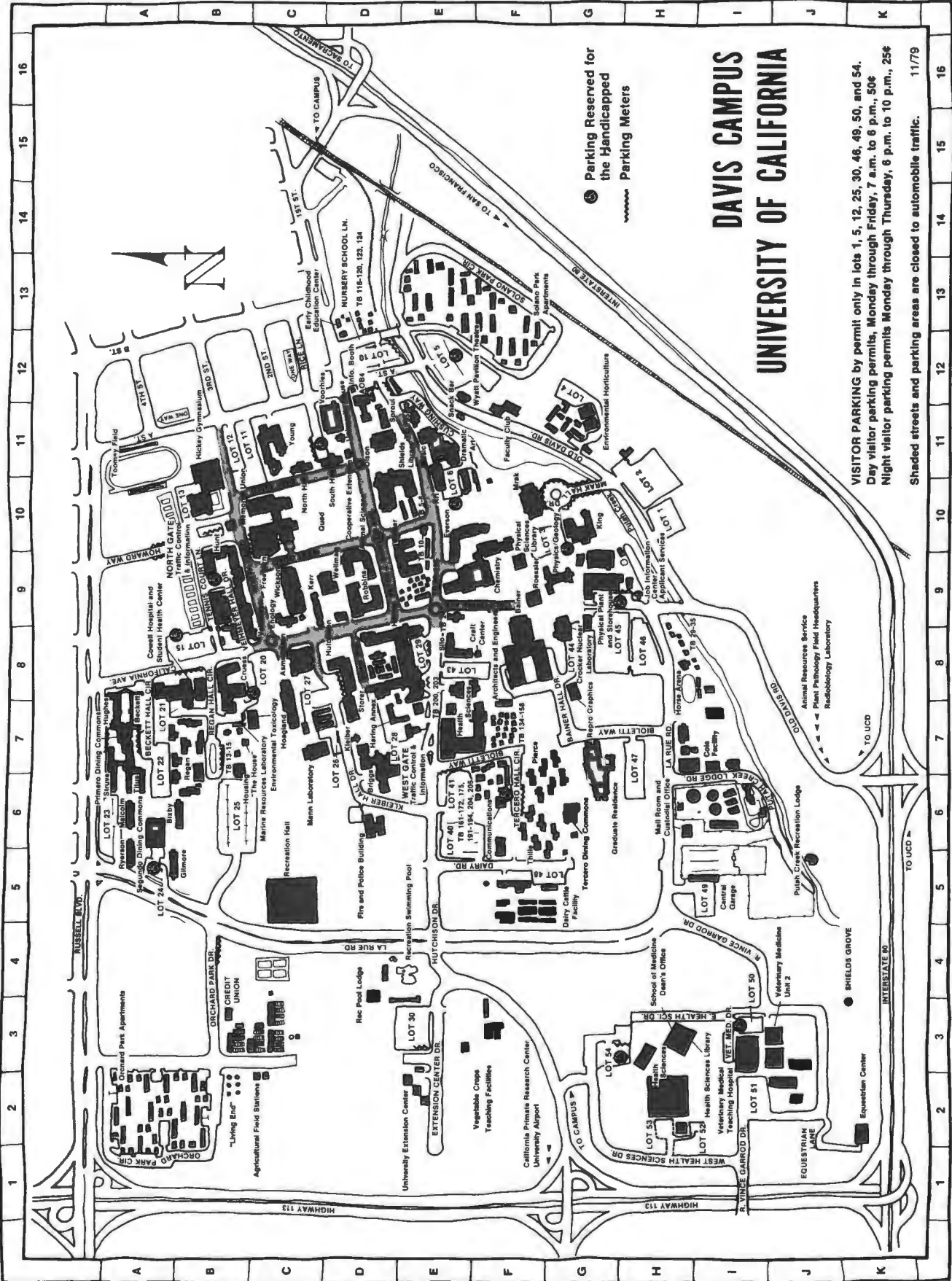
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